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DISINFECTING PHILADELPHIA'S WATER SUPPLY*

Experience With Chloride of Lime and Liquid Chlorine at Torresdale Filtration Plant, Treating Two Hundred Million Gallons a Day.

By FRANCIS D. WEST.†

Bleach was first used at Torresdales in the form of hypochlorite of soda, produced electrolytically, during September, 1909. Two cells manufactured by the National Laundry Co. were used. A current of 35 amperes at 110 volts was used to decompose a brine solution. The chlorine and soda were allowed to recombine and the temperature was so high (about 110° F) that chlorates were formed. The bleach was applied directly in front of the first valve of one of the preliminary filters operated at a 20 m. g p. a. d. rate, or about $\frac{1}{4}$ normal.

The conclusions were in part that the bacterial efficiency of the filter was considerably less than that of filters operated at four times the rate without treatment.

Hypochlorite was again used in December, 1910. Due to the fact that the bacterial efficiency of slow sand filters decreases considerably in cold weather and the faecal organism *B. Coli Communis* was present in the filtered water, it was decided to use chloride of lime to disinfect the water in the filtered water basin. Treatment was continued until April, 1911, when it was stopped; was again started December, 1911, and was continued without interruption until February, 1913.

Liquid chlorine was first used Nov. 26, 1913, in conjunction with chloride of lime, about 90 lbs. of liquid and 800 lbs. of powder being used daily until Feb. 9, when the use of chloride of lime was stopped.

*Paper before American Water Works Association.

†Chemist in Charge, Torresdale Lab., Phila. Bu. of Water.

THE BLEACH PLANT.

The plant at first consisted of two cedar mixing tanks each 5 ft. in diameter and 4 ft. deep and one solution tank of the same dimensions (capacity about 500 gallons) and a yellow pine orifice tank cubical in shape 2 ft. on a side. This tank was soon changed to a concrete tank of the same dimensions.

After 5 months' continuous use the tanks became so badly perforated that they could no longer be used.

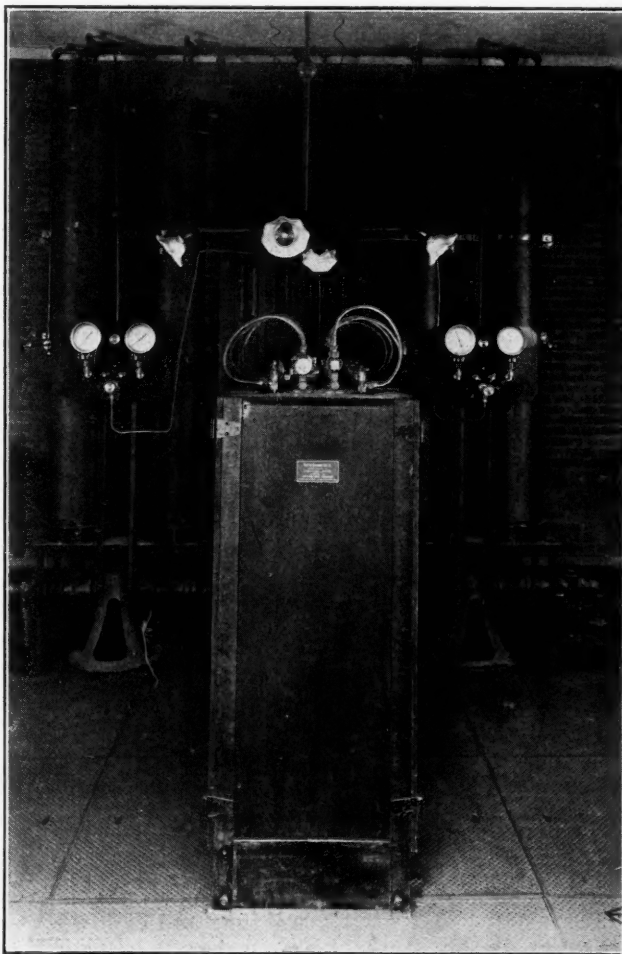
They were replaced by new tanks, which were later lined with 3 ins. of cement, reducing the capacity to 380 gals.

The cost of installation of this plant amounted to \$815 (this does not include the tanks purchased later) and the cost of operation for the first five months was 9 cts. per million gallons. The cost for 1912 was 9 cts. and for 1913 11 cts. per million gallons. No charge is allowed for time of sample collector or service of chemist.

Mixing was done by hand by two laborers using paddles, each mix receiving about two hours' agitation. From two to six mixes were made a day—usually three, using 500 and later 380 gals. of water a day.

Tests were made of samples of powder, of solution and of sludge, giving a close check on how well the bleach was mixed.

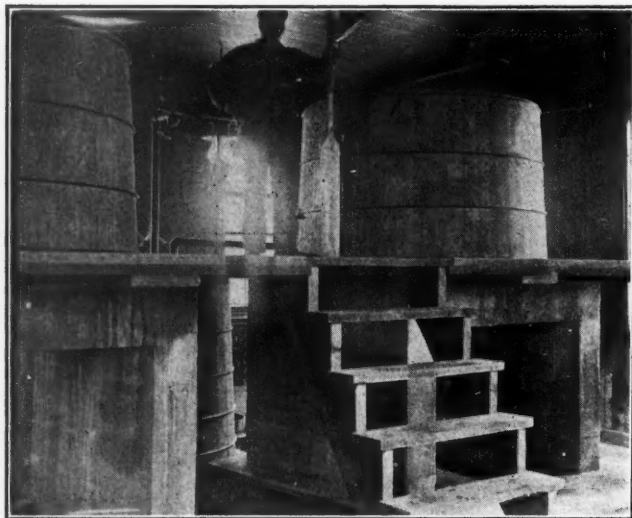
Table 1 shows the quantities of powder and strength of solutions used at different periods. The maximum amount was 3,480 lbs. per day and the minimum 420 lbs.



TORRESDALE LIQUID CHLORINE PLANT.

The amount of available chlorine wasted in sludge has varied from .1 to 7.0% and averaged about 1.0%.

This plant is located between the slow sand filters and the filtered water basin. The solution was fed into an air vent in the filtered water conduit, where the water has a velocity of 4 to 5 sec. ft. Owing to the location of the plant and the velocity of the water, it was im-



MIXING AND SOLUTION TANKS.

Table I.

A	B	C	D	E	F	G
420	36.0	151	10.1	3.6	0.28	.10
540	...	194	13.0	4.7	.36	.13
600	...	216	14.4	5.2	.40	.14
800	...	288	19.2	6.9	.53	.19
1,200	...	433	28.9	10.4	.80	.29
1,600	...	577	...	...	1.07	.38
2,000	...	720	...	...	1.33	.48
2,400	...	864	...	...	1.60	.58
3,200	...	1,154	...	...	2.13	.77
3,480	...	1,255	...	...	2.32	.84

A = lbs. powder per day. B = average available chlorine in bleach. C = lbs. available chlorine per day. D = per cent. of powder in solution tank at 500 gals. E = per cent. available chlorine in solution tank. F = parts per million powder in basin at 180,000,000 gals. G = parts per millions available chlorine in ditto.

possible to get a sample of the combined effluents of the filters before treatment and as a consequence we have been unable to tell exactly how much work the hypo has been doing. (Recently—Jan. 19, 1914—we made a vent in the filtered water conduit and placed in it a 4-inch pipe into which we lower our collecting device to get samples of filtered, untreated water.) Table 2 shows the results of treatment.

Table II.—Average Bacteria Count and Number of Positive Tests for B. Coli Communis in Torresdale Filtered Water Basin and Tap at Lardner's Point Pumping Station, 1911-1913, Inclusive.

Filtered Water Basin.		No. of Tests	Aver. Bact. per c.c.	(B. Coli) 1 c.c.	10 c.c.
Month, 1911					
Jan. to April and Dec.....	151	14	6	20	
Per cent positive.....	...	...	4.0	13.3	
May to Nov., inclusive.....	214	35	31	123	
Per cent positive.....	...	...	14.5	58.0	
January to April and December, treated; May to November, untreated.					
1912					
Average .....	...	44	...	...	...
Per cent positive.....	...	...	4.1	22.0	
Less ½ P.....	...	...	...	...	...
More ½ P.....	...	...	2.5	14.9	
1913					
Average .....	...	13	...	...	...
Per cent positive.....	...	...	1.4	8.5	

Note:—Tap at Lardner's Point Pumping Station shows the condition of the water after passing through a three-mile conduit 100 feet underground.

Lardner's Point Pumping Station.

Month, 1911	No. of Tests	Aver. Bact. per c.c.	(B. Coli) 1 c.c.	10 c.c.
Jan. to April and Dec.....	124	13	3	15
Per cent positive.....	...	...	2.4	12.4
May to Nov., inclusive.....	179	30	18	87
Per cent positive.....	...	...	10.0	48.6

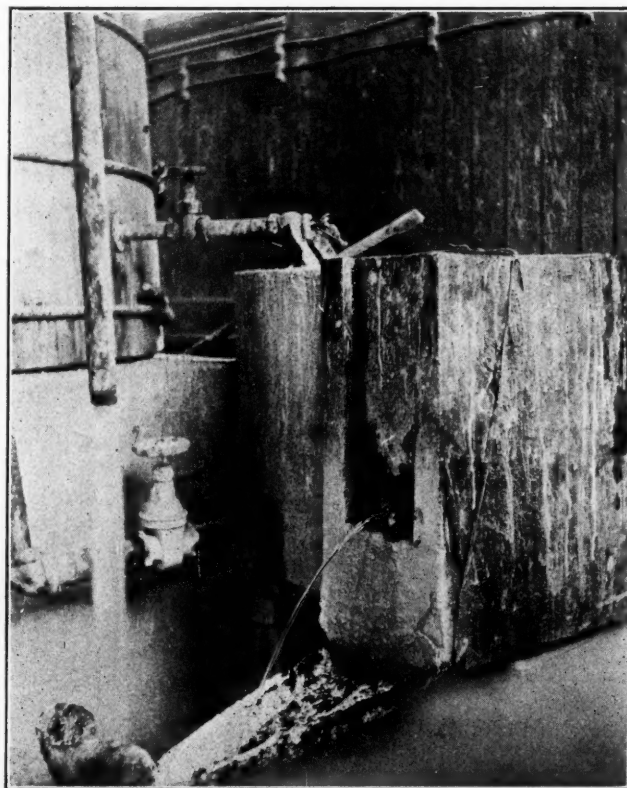
January to April and December, treated; May to November, untreated.

1912				
Average .....	...	30	...	...
Per cent positive.....	...	...	2.0	16.9
Less ½ P.....	...	...	...	...
More ½ P.....	...	...	1.1	9.1

1913				
Average .....	...	11	...	...
Per cent positive.....	...	...	1.0	11.6

By examining the results for May to November, 1911, it will be seen that the average number of bacteria in the filtered water basin during this period was but 35 per c. c. (omitting November it was only 19). The per cent. of positive tests in summer was very high. In July for 10 c. c. with a count of 9, 48% were positive, and for June with 14 bacteria, 51% were positive. During November, due to temperature changes, the bacterial efficiency decreased materially and the basin had an average of 120 with B. Coli present in 1 c. c. 13 days out of 30.

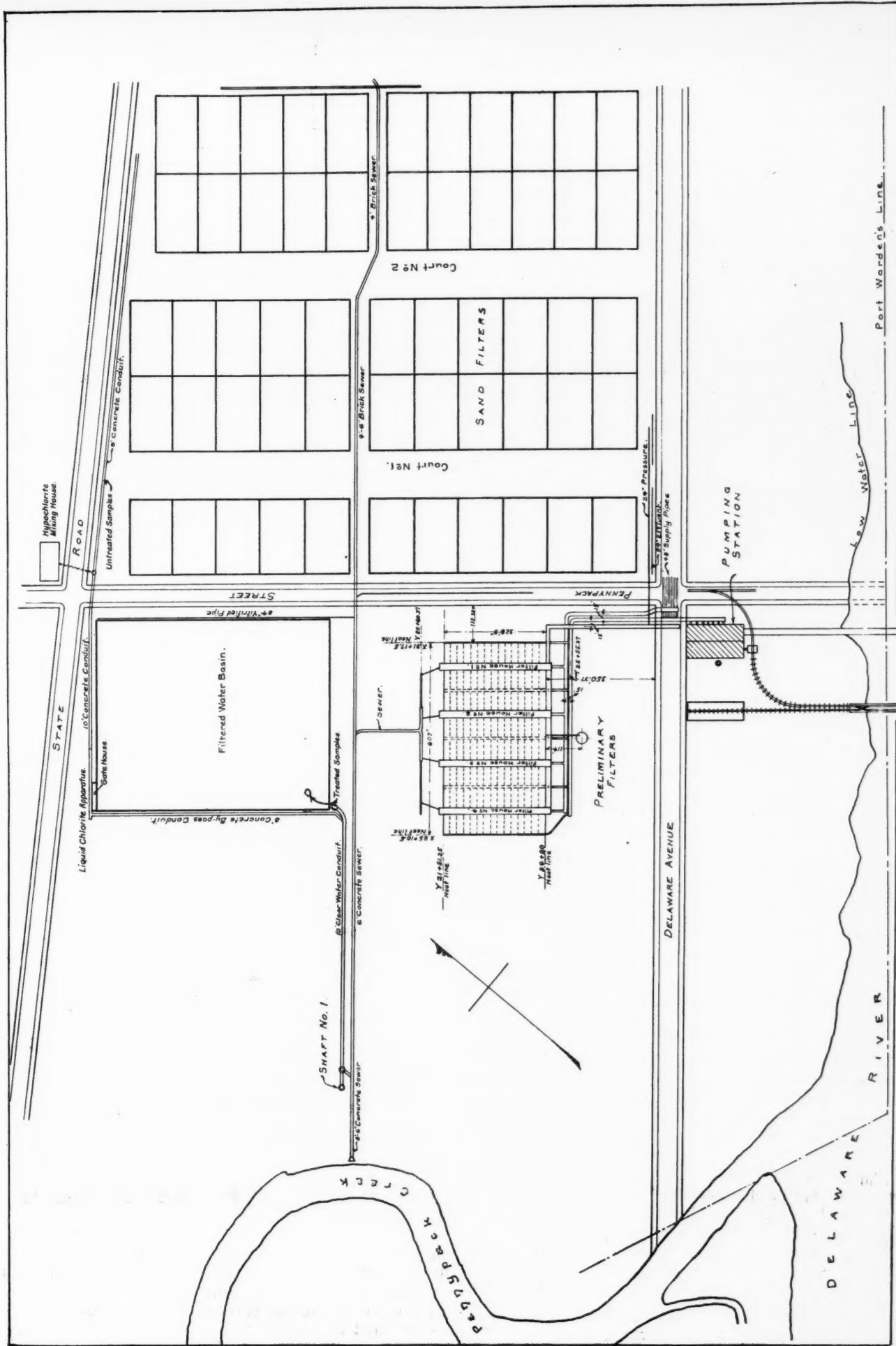
The effect of starting treatment in December is very noticeable. The use of one-half to one part per million of powder, while it did not keep the count low during the spring of 1912, did nearly eliminate B. Coli from the water that had passed the filters. The low count and lack of sufficient bleach caused the Department to use one-quarter to one-third part of powder during the sum-



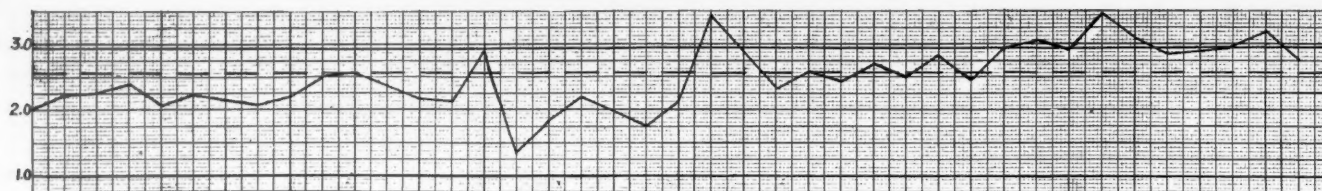
CONCRETE ORIFICE TANK.

mer and as a consequence the per cent. positive tests in 10 c. c. again went up, reaching 34% with a count of 13 in June and 26% with a count of only 7 in August.

During 1913, one-half part or more of powder was used all year and as a consequence the per cent. of positive tests for the basin was but 1.4% for 1 c. c. and 8.5% for 10 c. c.



GENERAL PLAN OF TORRESDALE FILTRATION PLANT.



Heavy line, theoretical amount—0.293 parts per million.
Broken line, average amount obtained—0.254 parts per million.

FLUCTUATIONS IN STRENGTH OF BLEACH APPLIED AT TORRESDALE, JAN. 10 TO 24.
1,200 pounds of powder at 38.6 per cent. available chlorine in 190 million gallons of water.

Disadvantages of Chloride of Lime.—There are several objections to the use of hypochlorite of calcium and to our method of applying it.

1. Variation in strength of solution. This is due chiefly to three things:

(a) The quantity of available chlorine in the powder has varied from 21% to 43%.

(b) The readiness with which the bleach mixes with water. I have seen two batches of equal strength, one of which mixed readily with little sludge and the other formed lumps seemingly impossible to break up.

(c) Hand mixing of 400 lbs. in 388 gals. of water. It is not reasonable to expect that this can be done thoroughly by hand. In fact the tanks are allowed to stand for different periods of time and the one in contact with water longest has the greatest strength.

2. Interruption to feed of solution. This may be caused, as happened, by one of three things:

(a) Corroding of orifice, decreasing the amount of flow.

(b) Stopping of orifice by lumps of sludge, and

(c) Choking up of delivery pipe.

3. Tastes and odors. This has been in all probability the most serious objection of any at other places, although we did not have many complaints. When we used over 2,400 lbs. per day some complaints were made.

The chart shows the variation in strength of solutions from a lot of bleach which had apparently a consistent amount of available chlorine. It also shows how much below the theoretical amount was the quantity actually obtained from the powder. Under the most advantageous conditions we were able to get but an average of .25 parts per million out of a theoretical amount of .293 parts or only 87% of what we should have gotten.

Allowing a general average of 36% of available chlorine in the powder, we obtained but 31%. This was with cans which were used as soon as opened. When a can is allowed to stand exposed even for a day, a material loss takes place. A figure of 30% available chlorine is then a high estimate of the amount got out of powder in practice; ordinarily with careless mixing, with no tests of powder or solutions and after exposure for days, as usually happens, 25% may be stated as the amount the average operator will add to the water. In considering the chart it may be noted that .6% chlorine was thrown away in sludge. Table No. 3 shows the amounts of chloride of lime used during 1912 and 1913:

USE OF LIQUID CHLORINE IN UNITED STATES.

The credit for the introduction of liquid chlorine for water disinfection belongs to Major C. R. Darnell, U. S. A. He first tried it in June, 1910. In November, 1911, he published in the Journal of the American Public Health Association under the title of "The Purification of Water by Anhydrous Chlorine," a description of his apparatus, together with the results of his experiments.* He applied the chlorine in the form of a dry

*See Municipal Journal, February 15, 1912.

Table III.—Monthly Averages of

Month	Percentage of Available Chlorine in Powder.		Parts per Million of Powder and Available Chlorine Used During 1913.	
	1912	1913	Powder	Chlorine
January	35.1	37.4	.82	.30
February	37.0	40.6	.76	.27
March	37.2	39.1	.84	.30
April	36.5	36.3	.79	.28
May	33.3	38.1	1.30	.47
June	32.3	34.3	1.06	.38
July	34.2	37.0	.54	.19
August	30.8	31.9	.51	.18
September	37.4	33.9	.51	.18
October	37.4	36.3	.77	.28
November	34.4	34.2	1.06	.38
December	36.3	35.3	.80	.29
Annual average..	35.2	36.2	...	...

Table IV.—Variations, Number of Days.

1912 (calculated on 190,000,000 gallons per day).

Lbs. Powder per Day	Number of Days	Parts per Million of Powder and Available Chlorine Used During 1913.	
		Powder	Chlorine
420	35	.27	.09
600	26	.38	.13
630	85	.40	.14
800	130	.51	.18
1,000	4	.63	.22
1,200	48	.76	.27
1,600	23	1.01	.35
1,733	1	1.09	.38
2,000	3	1.27	.44
2,266	1	1.43	.50
2,400	9	1.52	.53

1913 (calculated on 180,000,000 gallons per day).

Lbs. per Day Powder	Liquid Cl.	Number of Days	Parts per Million of Powder and Available Chlorine Used During 1913.	
			Powder	Chlorine
800	..	92	.53	.19
800	90	14	.53	.25
800	105	13	.53	.26
1,200	..	131	.80	.29
1,200	10	1	.80	.30
1,200	90	4	.80	.34
1,600	..	73	1.07	.38
1,600	90	4	1.07	.41
2,000	..	15	1.33	.48
2,400	..	14	1.60	.58
3,360	..	3	2.25	.81
3,480	..	1	2.32	.84

gas to the water to be treated. Major Darnell carried out a series of tests with an apparatus with the capacity of 500 gals. per hour.

The Board of Officers of the War Department concluded (June, 1911):

"That the apparatus is as efficient as purification by ozone or hypochlorite and is more reliable in operation than either.

"That it could be installed at a very low cost and that the cost of operation would be very slight."

In June, 1912, Dr. Geo. Ornstein constructed an experimental apparatus for the use of chlorine gas for water and sewage sterilization, employing an entirely different principle from Major Darnell's, involving the absorption of the gas in water prior to its application to the fluid to be treated.

In September, 1912, Seth M. Van Loan, assistant chief engineer Philadelphia Bureau of Water, assisted by Geo. E. Thomas, chemist Belmont Laboratory, experimented with liquid chlorine on a large scale at Belmont filter plant. They fed the chlorine into the filtered water basin in the form of a gas, regulating the quantity by loss in weight of the containers, 46 lbs. per day being applied to 36,000,000 gals water. With the approach of cold weather the difficulty of freezing was encountered. Later the cylinder was jacketed and heated by a lamp.

Early in November John A. Kienle, then chief engineer of the Water Department of Wilmington, Del., worked along similar lines at the Wilmington plant. By the use of high and low pressure valves he was able to regulate the flow of gas. His results were presented at the 1913 convention of the A. W. W. A. and were also published in the engineering papers. He worked in conjunction with the Electro-Bleaching Gas Co., who installed their apparatus January, 1913. This apparatus makes use of an absorption tower, whereby the chlorine is absorbed by a small amount of flowing water, which carries it into the supply to be treated.

About the same time D. D. Jackson was experimenting at Ridgewood reservoir, Brooklyn, and shortly afterward put out the Leavitt-Jackson liquid chlorine machine. This machine operates on the basis of a balanced beam, feeding the gas according to loss in weight. The gas is fed directly into the water to be treated similarly to the Darnell apparatus.

The first complete set of results for a continued period were those from the Niagara Falls plant operated by the Western New York Filtration Co. under direction of H. F. Huy. (For the use of these results the author's thanks are due Mr. Huy and J. W. Ledoux, chief engineer American Pipe and Construction Co.)

In Philadelphia.—The first permanent liquid chlorine plant in Philadelphia was installed at Queen Lane filter plant September, 1913. A contract for ten plants, two at each of the five filter plants, was awarded the Electro-Bleaching Gas Co. for \$9,750. The plants were installed during October and November, 1913, that at Torresdale starting Nov. 25. Photographs show the liquid chlorine plants at Queen Lane, at Upper Roxboro and the one at Torresdale. The latter plant is located at the inlet house of the filtered water basin. This gate house is directly over the two inlet chambers fed by a 10-foot conduit. The water enters the basin through eight 48-inch valves, four in each chamber.

General Description of Apparatus.—From four to eight cylinders of liquid chlorine are connected by means of flexible copper coils to a manifold with a valve for each cylinder. The manifold is connected with a gauge used to determine initial pressures.

Beyond this gauge are two regulating valves, the first reducing the initial pressure to about 15 lbs. per sq. in. and the second for regulating the pressure through a range sufficient to give the desired amount of gas. A low pressure gauge calibrated empirically indicates the flow of gas.

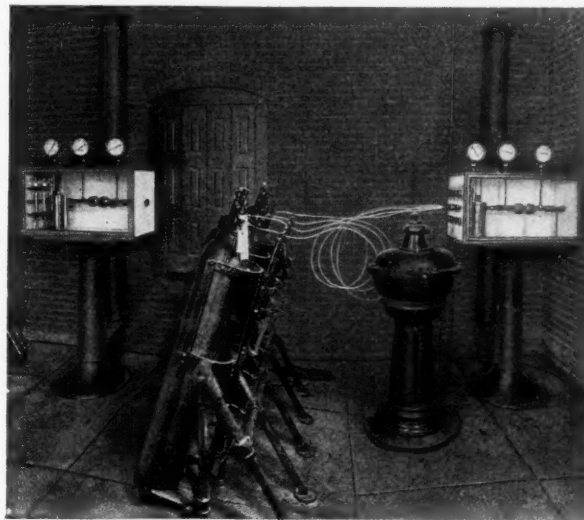
The gas then passes through a $\frac{3}{8}$ -inch hard rubber pipe to the bottom of the first absorption tower. This tower is 8 feet high and is filled with coke to give surface. It is sealed, the excess gas passing through a second pipe to the bottom of a second tower. These towers as well as all other parts from this point on are made of hard rubber.

Water is admitted through the top of the towers, and the chlorinated water passes through a 4-inch horizontal pipe 58 feet long, connected with eight drops $\frac{3}{4}$ -inch in diameter extending to within one foot of the bottom of the chamber and protected from the current by $1\frac{1}{2}$ -inch

iron casings. About three feet of flexible rubber hose is attached to the ends of these pipes. The ends of the hose are kept in motion by the swirl of the current.

Owing to the large quantity of chlorine needed (as high as 10 lbs. per hour) it was planned to feed the chlorine in liquid form through the cylinder valves having an evaporator placed next to the high pressure valve. This was done to prevent freezing owing to the reduction in temperature due to the rapid evaporation. Cradles were provided for inverting the cylinders. The evaporator was prevented from freezing by having a constant flow of water passing around it.

From almost the start trouble was experienced. The needle and regulating valves of the apparatus gradually choked up with the impurities in the chlorine cylinders, chiefly ferric chloride mixed with an oil-like substance having the consistency of petrolatum. Liquid chlorine was allowed to pass through the feed pipe of the tower, corroding and choking this up. Liquid chlorine found its way through the coil in the evaporator, where it came in contact with the water used for cooling and the whole apparatus went out of commission. (In spite of all these difficulties a supply of chlorine was kept up with but two shut-downs of any consequence.)



QUEEN LANE PLANT, SHOWING CRADLES.

When it was found impossible to supply the gas in this manner, the cylinders were used vertically and an electrically heated cabinet with automatic thermostatic control, as shown in photograph, was installed. This keeps the cylinders at a temperature of 75° F and but little trouble with freezing is experienced.

RESULTS FROM TREATMENT AT TORRESDALE, BELMONT, UPPER AND LOWER ROXBOROUGH AND QUEEN LANE, PHILADELPHIA.

Liquid Chloride Compared With Bleach at Torresdale Filter Plant.—As liquid chlorine has been used by itself only since Feb. 8, it is difficult to get figures that are exactly comparable. It was on the following data that the estimate of a strength of 1 to 6 was based.

Test No. 1.—Comparing Feb. 22-March 31, 1912, with the same period of 1914, and with the period Jan. 19-Feb. 28, 1914, when the condition of the water approached that of the early spring of 1912.

The water during the period of Feb. 22-March 31, 1912, was the worst water that the Torresdale plant has been called upon to handle. Comparing A and B, the efficiency of 1.3 lbs. per million gals. compared with 9 lbs. bleach (a ratio of 1 to 7) was 90% against 64%. Comparing C with A (a substitution of .8 lb. of liquid chlorine for 4.5 lbs. of bleach, or a ratio of 1 to 6), the number of

bacteria in the effluent was 118 against 260 and the per cent of B. Coli was correspondingly lower.

Test No. 2.—In January, 1914, 870 lbs. bleach and 105 lbs. liquid chlorine were used per day. In March 234 lbs. liquid chlorine were used; this is a substitution of 129 lbs. chlorine for 870 lbs. bleach (a ratio of 1 to 6.7).

Test No. 3.—Comparing November, 1913, with an average of 1,620 lbs. bleach per day and 90 lbs. liquid chlorine during the last four days, with March 1.3 lbs. per million gals., or 234 lbs. per day.

Test No. 4.—Comparing April, 1913, with April, 1914.

Test No. 5.—In February 800 lbs. of bleach were used for 8 days and during the month an average of 1 lb. liquid chlorine per million gallons of water was used.

In March, with an effluent of 305, the treated water had a count of 27 per c. c.

From November, 1913, to April, 1914, inclusive, with about $\frac{3}{4}$ lb. of chlorine per million gallons, the average number of bacteria in the basin was 10 per c. c.; out of 358 tests for B. Coli, for 1 c. c. 2 or .56% were positive, and for 10 c. c. 16 or 4.5%.

Lower Roxboro.—In November, 1913, a substitution of 6 lbs. of liquid chlorine per day was made for 48 lbs. of bleach. This 6 lbs. was reduced to 3.5 lbs., or .35 lb. per million gals., on Dec. 12, and the count for December averaged but 9, with B. Coli absent. Excellent results were obtained with but 3.2 lbs. of bleach per million gals.

From the time of the introduction of liquid chlorine to April 30, out of 168 tests for B. Coli not one positive test in 1 c. c. was obtained and only three in 10, or 1.8%.

Upper Roxboro.—This is the banner plant of the city; its high efficiency in the past without treatment has

Test No.	Dates	Bacteria per c.c.			Per Cent Removed	B. Coli Communis			Treatment
		Applied	Filter Effluent	Treated Water		No. of Tests	1 c.c.	10 c.c.	
Test No. 1—									
A.	Feb. 22 to March 31, 1912..	17,000	760*	260	64	39	2	13	9 lbs. bleach per M. gallons.
B.	Feb. 22 to March 31, 1914..	6,800	320	30	90	39	0	5	1.3 lbs. liquid cl. per M gals.
C.	Jan. 19 to Feb. 28, 1914..	12,000	710	118	83	41	0	5	{ 4.5 lbs. bleach; Jan. 19 to Feb. 9 included 0.8 lb. liq. cl.
Test No. 2—									
January	.....	13,500	900	227	75	31	2	5	.....
March	.....	7,200	305	27	91	31	0	3	.....
Test No. 3—									
November, 1913	.....	8,500	170*	31	82	30	1	8	.....
March, 1914	.....	7,200	305	27	91	31	0	3	.....
Test No. 4—									
April, 1913	.....	3,320	50*	10	80	30	0	0	7 lbs. bleach per M gals.
April, 1914	.....	2,070	89	11	88	30	0	1	1.0 lb. liquid chlorine.
Test No. 5—									
February, 1914	.....	7,250	460	99	78	..	..	4	.....
*Approximate.									

*Approximate.

EFFICIENCY OF LIQUID CHLORINE AT SCHUYLKILL RIVER PLANTS.

The actual effect of treatment at the Belmont, Queen Lane, Upper and Lower Roxboro plants can only be estimated, as the disinfecting apparatus are so placed that no tests of filtered, untreated water can be obtained.

The author gives tables of results obtained at each of the four plants, but limitations of space do not permit us to reproduce them. His summary and statement of the more important results follow:

Belmont.—Bleach was first used at Belmont Mar. 19, 1912. On Nov. 18, 1913, the Electro-Bleaching Gas Co. machine was started, 42 lbs. of chlorine being substituted for 220 lbs. of bleach, or about 1 to 5. The chlorine was later reduced to a range of 33 to 39 lbs., or approximately 1 to 6. No direct comparisons are available except November, 1913, as follows:

Nov. 1 to 17, inclusive, 220 lbs. bleach; Av. bact. 8 per c. c.; B. Coli, 17 tests, 1 c. c., 2 positives, 10 c. c., 6 positives. Nov. 18 to 30, inclusive, 42 lbs. chlorine; Av. bact. 4 per c. c.; B. Coli, 13 tests, 1 c. c., 0 positive, 10 c. c., 1 positive.

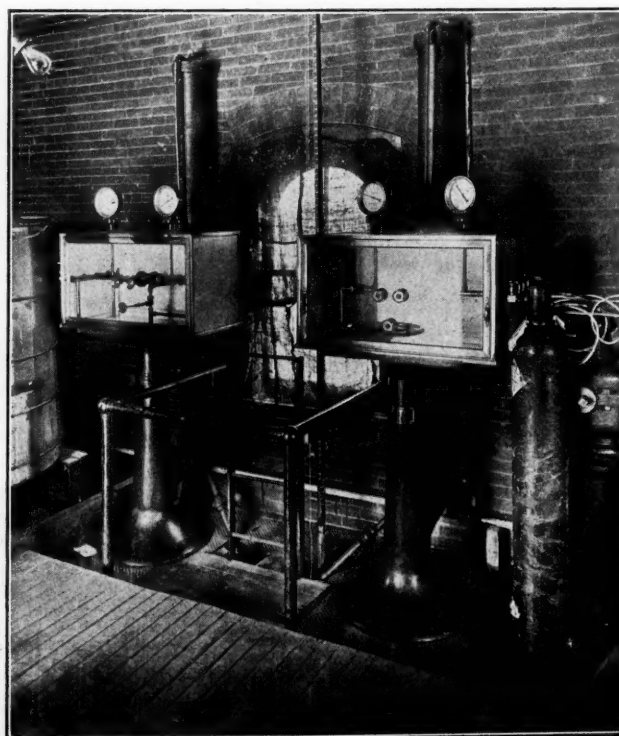
On Feb. 27 the liquid chlorine plant was down for two hours and the count went up to 260 per c. c.

For the $5\frac{1}{2}$ months when chlorine was used, out of 164 tests for B. Coli only one positive test was obtained in 1 c. c. and but 5 positive in 10 c. c., or .6% and 3.0%.

In March, 1914, with an applied of 10,700 bacteria per c. c., the effluent averaged but five.

Queen Lane.—This plan was started January, 1913. In October, 10 lbs. of chlorine were applied to the north basin and 90 lbs. of bleach to the south basin. Although the average bacteria count was but 8, B. Coli was present in 10 c. c. N. basin, 10 lbs. chlorine; 31 tests; 1 c. c., 2 positive; 10 c. c., 15 positive; S. basin, 90 lbs. bleach; 31 tests; 1 c. c., 1 positive; 10 c. c., 16 positive.

largely been due to the fact that eight days' sedimentation precedes filtration. The counts are so uniformly low, both with the use of bleach and with liquid chlorine, that it is hardly possible to compare counts. It is sufficient to note that since the introduction of liquid chlorine in November, 1913, an average count of but three has



UPPER ROXBORO LIQUID CHLORINE PLANT.

been obtained and there has been but one positive test for B. Coli out of 172 tests, and that in 10 c. c.

The amount of 14 lbs. of chlorine per day for 15,000,000 gallons seems excessive; in fact, on April 14 the amount of chlorine used at all the Schuylkill plants with the exception of Queen Lane was reduced to ½ lb. per million gals., or a cost of but 5 cts. per million.

SUMMARY OF SCHUYLKILL PLANTS NOVEMBER, 1913, TO MARCH 1914, INCLUSIVE.

Plants	No. of Tests	B. Coli Communis			
		No. in 1 c.c.	Per cent positive	No. in 10 c.c.	Per cent positive
Queen Lane	358	2	.56	16	4.5
Belmont	164	1	.61	5	3.0
Lower Roxboro....	168	0	.00	3	1.8
Upper Roxboro....	172	0	.00	1	.58
Totals	862	3	.35	25	2.9

Average number of bacteria per cubic centimeter in the filtered water basins of the five plants of the city of Philadelphia for the month of April, 1914, after treatment with liquid chlorine:

	Upper Roxboro.	Lower Roxboro.	Belmont.	Queen Lane.	Torresdale.
1.....	2	8	2	10	11
2.....	1	3	5	3	51
3.....	1	6	4	4	15
4.....	2	5	2	8	10
5.....	2	3	2	5	16
6.....	2	4	4	4	8
7.....	2	2	3	4	8
8.....	3	3	2	4	8
9.....	2	2	2	4	9
10.....	2	4	4	5	18
11.....	2	4	2	4	18
12.....	1	10	2	12	16
13.....	4	2	3	6	52
14.....	2	5	6	6	9
15.....	2	4	6	5	6
16.....	2	2	2	4	9
17.....	1	4	4	8	*9
18.....	3	1	4	4	5
19.....	2	2	1	4	10
20.....	1	1	2	1	4
21.....	0	2	2	1	7
22.....	1	1	1	1	6
23.....	0	1	1	0	9
24.....	0	0	1	2	6
25.....	1	1	1	2	12
26.....	0	4	1	9	8
27.....	0	0	1	2	8
28.....	0	0	0	1	8
29.....	1	1	0	0	6
30.....	2	2	0	10	14
Average....	1	3	2	4	13

*Coli positive in 10cc. 180 tests of 1 and 10 cc, all negative except as shown.

ADVANTAGES OF LIQUID CHLORINE OVER CHLORIDE OF LIME.

There are several claims made for liquid chlorine, an analysis of which may prove of value.

1. That liquid chlorine is an absolutely pure chemical. As far as I have been able to determine, the liquid chlorine we have handled is pure, the chief impurity being ferric chloride due to the action of the chlorine on the cylinder.

2. That it is concentrated in small cylinders, while chloride of lime is bulky, requiring large space for storing. As to the saving in space required, a 100-lb. cylinder occupies 64 square inches floor space. A stock for 50 days at 200 lbs. a day would occupy a space of 45 square feet 5 feet high. Two thousand pounds of bleach, enough for but 17 days at 1,200 lbs. per day, would occupy (taking the cans at 750 lbs. each) 160 square feet. On a basis of 6 to 1, about 10 to 11 times as much space is required for bleach as for liquid chlorine.

3. That with efficient controlling devices, liquid chlorine will eliminate the disagreeable odors and corrosive influences of chloride of lime; consequently the in-

stallation may be placed in positions where the use of chloride of lime is impossible.

Ordinarily this is true. The odor of chlorine at Torresdale is hardly noticeable, but there are times when, due to carelessness or accidents, the atmosphere has been unbearable and chlorine has escaped in large amounts. (This has usually been caused by the failure of the water supply used for absorption, and not by the apparatus.)

4. That liquid chlorine will retain its full efficiency over unlimited time, whereas chloride of lime deteriorates rapidly.

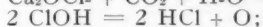
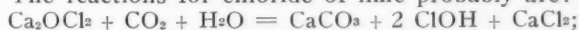
This is one of the best arguments for liquid chlorine, especially for small installations.

5. That the floor space occupied by liquid chlorine plants is small, whereas chloride of lime installations require large mixing tanks, etc.

The space occupied at Torresdale for bleach treatment, independent of the space for weighing, was 22 ft. by 16 ft. For the liquid chlorine apparatus the cabinet is 2 ft. by 4.4 ft., and the space occupied by the towers is 10 ft. by about 2 ft.

6. That the reaction with liquid chlorine is simplified, while that with chloride of lime is complex and less effective at low temperature.

The reactions for chloride of lime probably are:



Jackson ("Sterilization of Cleveland Water Supply") gives the first part of the reaction as $\text{CaOCl}_2 + \text{H}_2\text{O} + \text{CO}_2 = \text{CaCO}_3 + \text{HOCl} + \text{HCl}$. For liquid chlorine Jackson gives $\text{Cl}_2 + \text{H}_2\text{O} = \text{HOCl} + \text{HCl}$ and $\text{HOCl} + \text{HCl} = \text{HCl} + \text{O}$.

I question if hypochlorous acid is formed and prefer the simple reaction of $\text{Cl}_2 + \text{H}_2\text{O} = 2 \text{HCl} + \text{O}$.

This is a liberation of 23 per cent by weight of nascent oxygen, which, together with the powerful disinfecting action of the chloride itself acting before it decomposes water, gives the increased efficiency.

Note.—It has been noticed in some places (Belmont Filter Plant in 1912) where the dry gas has been fed directly into the water to be treated that bubbles rise to the surface, especially when large amounts are used. This is due to the fact that the specific gravity of the gas is so low that it rises to the surface before it has time to be absorbed by the water. At 234 lbs. a day we use 2.6 oz. per minute, or, at 760 mm. pressure, about 1,420 cu. in. per minute, or nearly one cubic foot.

7. According to D. D. Jackson (Proc. A. W. W. A., 1913), 1 lb. liquid chlorine equals 9 lbs. chloride of lime. According to J. A. Kienle (Proc. A. W. W. A., 1913), it equals 8 lbs. Theoretically it should equal about three, but in practice considerable available chlorine is lost, and the theoretical amount is nearer 1 to 4. Huy, at Niagara Falls, claims to get as good results with 3 lbs. of liquid chlorine per day with 6,000,000 gals. of water as he did with 30 lbs. of powder. He added 30 lbs. to the filter effluent; he adds 9 lbs. of liquid to the water in the sedimentation basin and 3 lbs. to the effluent of the filters. The results are not quite comparable.

At Torresdale we are using liquid chlorine at the rate of about 1 to 6 to 1 to 7. It is quite possible that with careless handling and storing of bleach at small plants the figure is nearer 1 to 8 than 1 to 6.

8. That no taste or odor appears in water treated with liquid chlorine.

Major Darnell states that at least two parts of liquid chlorine, equivalent to 16 lbs. per million gallons, must be used to give the slightest taste to Potomac river water. Huy stated that when using 5 lbs. per million gallons, a slight taste was noticed in the laboratory directly after dosing. In a test at the Connecticut Hospital for the Insane, Middletown, Conn., 14 lbs. per million gallons were used without its being noticed.

It is quite possible that if the dosage is heavy enough the water will have a taste. Figuring on a basis of 6 to 1, 30 lbs. of chloride of lime would be needed to correspond to Huy's 5 lbs., and 80 lbs. to the amount mentioned by Darnell. From a close examination of the literature on chloride of lime and from personal observation, the amount of chloride of lime that will give a taste to water may be estimated at from 7 to 20 lbs. per million gallons of water; the average figure will be from 10 to 12. At the above rating this would mean 2 lbs. of liquid chlorine. A heavy overdose can be given without complaints.

9. That liquid chlorine does not change the character of the water by the introduction of lime salts. The lime salts will usually amount to not over one part per million.

10. That liquid chlorine necessitates no labor cost, while chloride of lime does. This is true, but a liquid chlorine plant requires skilled supervision to be operated properly, and is not fool-proof.

11. That liquid chlorine leaves no sludge. This is self-evident.

12. That liquid chlorine will reduce the amount of alum needed for bacterial removal. There can be no question but that in cases where the water is comparatively clear, and where alum is used chiefly for bacteria removal, if liquid chlorine is used before filtration it will make a marked saving in the cost of alum, and in many cases will not only pay for itself, but will decrease the general cost of the plant. A saving of $\frac{1}{2}$ grain per gallon of alum at 1 cent per pound, by the use of 1 lb. liquid chlorine per million gallons at 10 cents, means a saving of 61 cents per million gallons.

13. That the feed of liquid chlorine is regular from hour to hour, and that the feed of chloride of lime varies constantly.

The irregularity of the feed of bleach at Torresdale under the best of conditions was shown in the first part of the paper. We make readings of the gauges on the liquid chlorine machines every hour and a half, and the fluctuations during any one day will not ordinarily vary over $\frac{1}{2}$ lb. from the desired amount.

That the disinfection is continuous throughout the 24 hours is shown by the table giving maximum, minimum and average results of tests every two hours for 15 days. Samples marked Lardner's Point, House No. 2, were collected from pump No. 10, Lardner's Point pumping station, three miles from Torresdale basin. The

cause nausea. With ordinary common sense and judgment on the part of the operator this is not likely to happen. The greatest danger lies in faulty cylinders and faulty valves. If the cylinder valve will not turn off, or if the cylinder leaks, it must be gotten out to the open air and the chlorine allowed to escape. Careful inspections of cylinders and valves must be made.

Liquid chlorine when it comes in contact with moisture has a very corrosive action, but this has been overcome by the use of hard rubber pipes and towers.

COMPARATIVE COSTS.

The following estimated comparative figures are submitted: Chloride of lime costs us from \$1.22 to \$1.70 per 100 lbs.; the usual quotation was \$1.34, and the average figure \$1.40. Taking \$1.40 as a basis, we used during 1913 an average of a little over 1,200 lbs. a day, or \$16.80 a day for powder. Two laborers, at 25 cents per hour, were employed for eight hours, or \$4 per day; making a total cost of \$20.80 per day, exclusive of repairs, sample collecting or laboratory analyses.

One hundred and eighty pounds of liquid chlorine (the amount used April 10) would cost, at 10 cents per pound, \$18 per day. We have now passed the worst condition of the year—February and March—when we used 234 lbs. a day or \$23.40 cost. It is expected that we will be able to reduce the amount of liquid chlorine to at least $\frac{3}{4}$ lb. per million, or 120 lbs. a day.

Some supervision and handling of cylinders is required. At present the work is done by a \$3-a-day mechanic who also keeps the pre-filters in repair. His wages are charged against the pre-filters. A charge of \$1 per day would be fair for this service. This is partly balanced by the discontinuance of laboratory analyses.

The labor cost during 1913 of \$4 per day at Torresdale, with its output of 180,000,000 gals., amounted to but 2.2 cents per million gallons. At Belmont and at Queen Lane the labor cost of about \$1.50 per day amounted to 3.8 cents and 3 cents, respectively. At Roxboro plants the labor cost averaged over \$1 per day for mixing; this at Lower Roxboro cost 10 cents per million, and at Upper Roxboro 6.7 cents per million.

The cost per million gallons at these plants during 1913 amounted to 16 to 18 cents. At 1 lb. per million gallons for liquid chlorine, the cost would be 10 cents, or a saving of 6 to 8 cents per million gallons. On April 14th the quantity used was reduced to $\frac{1}{2}$ lb per thousand, or a cost of 5 cents, a saving of 11 to 13 cents per million.

Table Showing Regularity of Disinfection.

Date	Effluent Filters	Bacteria per Cubic Centimeter				Liq. Cl., Lbs. per M. Gals.
		Filtered Water Basin	Maximum	Minimum	Average	
3/28	160	9	28	7	13	1.3
29	70	14	20	6	13	1.3
30	330	18	25	8	15	1.3
31	660	16	23	10	17	1.3
4/1	520	11	28	8	16	1.3
2	680	51	41	4	16	1.3
3	200	15	24	6	15	1.3
4	170	10	27	8	14	1.3
5	120	16	51	7	17	1.3
6	71	8	29	3	12	1.3
7	62	8	16	5	9	1.2
8	47	8	15	6	9	1.0
9	57	9	15	6	10	1.0
10	45	18	14	9	12	1.0
11	94	18	17	9	13	1.0

averages are averages of 12 tests made every two hours. The samples from the effluent of the filters and the filtered water basin are collected at 9 A. M.

OBJECTIONS TO USE OF LIQUID CHLORINE.

The chief objection to the use of liquid chlorine lies in the concentrated energy of the material itself. If liquid chlorine is set free in a small enclosure it will

Belmont and Queen Lane are saving a labor cost of 3.8 and 3 cents per thousand gallons. Belmont is operating at a rate of $\frac{1}{2}$ lb., and Queen Lane at $\frac{3}{4}$ lb., or about 5 and 7.5 cents.

On April 21st the amount used at Torresdale was reduced to $\frac{3}{4}$ lb., or a cost of \$13.50 per day, exclusive of a possible charge of \$1 for labor.

In general, the cost of the two processes should be about equal; if anything, liquid chlorine should prove cheaper.

GENERAL SUMMARY AND CONCLUSIONS.

Disinfection has been found absolutely necessary at Torresdale; at least one-half part of chloride of lime, or the minimum we reached in 1913 of 800 lbs. a day, is needed.

With the use of liquid chlorine it is necessary to have an accurate determination of the flow of gas; it must be kept in such condition that it will not corrode the apparatus, and a proper absorption of the gas must be

obtained. This has been accomplished by the use of absorption towers, which require from 50 to 100 gals. of water per pound of chlorine used.

While in some instances liquid chlorine may prove more costly than chloride of lime, the regularity with which it can be applied, the more effective action on pathogenic bacteria, the small, compact apparatus and the absence of the odor of chlorine around the plant recommend it as a satisfactory substitute for hypochlorite, having, as it does, all the advantages of the latter, and only some of the faults.

The author also gave in his paper results obtained at Wilmington, N. C., Wilmington, Del., Montreal, Canada, and Niagara Falls, N. Y. These we may publish at a later date.

PAPERS READ BEFORE THE AMERICAN WATER WORKS ASSOCIATION CONVENTION

Abstracts of Most of Them and of the Discussion of Them by Members on the Floor of the Convention

An effort is made to present, in as condensed form as possible, the most important points in most of the papers read at the American Water Works Association convention, and also in the discussions of them by the members. The description of the use of hypochlorite and of liquid chlorine in disinfecting Philadelphia's water supply is given practically in full (except for some of the tables) in another part of this issue, because of the general interest in that subject and the very complete presentation given by the author. For the same reason the paper on Hydrant Rentals, by John W. Alvord, will be given in full in a later issue, there being no room for it this week. Some of the abstracts of papers and discussions also are postponed to another issue because of lack of room. These abstracts are given in the order in which they were read, as far as possible.

SEWAGE POLLUTION OF BOUNDARY WATERS.

By ALLEN J. McLAUGHLIN, Surgeon U. S. Public Health Service.

A brief statement concerning the work of the International Joint Commission in studying the pollution of the Great Lakes was given in the January 22d issue of Municipal Journal. Dr. McLaughlin in his paper reviews this work, and states concerning the Great Lakes as a source of water supply as follows:

The delusion that water from the Great Lakes or their connecting rivers needs no purification has been cherished for years in our cities, and even with our disgraceful record of water-borne typhoid and the lessons of numerous disastrous epidemics, it is still no easy task to convince municipal officials that purification of these waters is necessary.

The remedies suggested by the writer at that time were:

1. Safe water supplies—that is, water shown to be safe by daily bacteriologic examination.
2. Supervision and control of water supplies by the state to ensure efficiency and a safe effluent at all times.
3. Control of sewage discharge within permissible limits to prevent an unreasonable burden or responsibility upon filter plants.
4. Prevention of pollution from vessels.

In order to secure efficient and uniform results from the application of these remedies, he recommended that two sets of standards for water be formulated:

1. Standards for filtered or treated water.
2. Standards for raw water at the intakes.

In accordance with this recommendation, in January, 1913, the surgeon-general appointed a commission for the determination of a standard of purity for drinking water, and the report of that commission will soon be published. This report will furnish us with a minimum standard to which all common carriers, trains and vessels, must conform, to prevent the spread of disease in interstate traffic. This furnishes the first standard recommended.

In conclusion he calls attention to the necessity for bacteriologic control of water purification plants. "Even if these are perfect in design and construction, unless

efficiently operated and controlled a safe effluent need not be expected." The writer has seen perfect filter plants designed by the best engineers "placed in the hands of an assassin who was a promoted stoker and absolutely ignorant of bacteriology or chemistry." He also expresses the opinion that because a water is filtered by cities using it, it should not be considered unnecessary to prevent its previous pollution, since this may place an unreasonable responsibility upon the filter. Filters are not infallible and operators are only human, and the added security of reducing pollution by sewage treatment is desirable.

The greatest obstacle to proper operation and control of plants he believes to be the difficulty of securing the right man to place in charge of them. For this he recommends a young graduate sanitary engineer, who will have sufficient knowledge to adjust the chemicals to the requirements of the raw water and to make daily bacteriological examinations. "Nearly all the disasters due to sewage polluted water supplies which have occurred were due to lack of daily bacteriological knowledge of the public supply or the inefficient operation of plants by unskilled men. * * * He can conceive of cases where it is impossible for economic reasons to pay the necessary salary. In these cases local men must be employed and trained to do the work. Here the State Board of Health or, as in Illinois, the State Water Survey, will find a very useful function. The state authorities could supervise the installation of a small inexpensive laboratory equipment in small plants and give instruction to the local men in making the necessary water examinations. Whenever possible, however, young graduates of sanitary engineering schools should be employed, and such men are well worth their salary, considering the saving in the economical adjustment of chemicals and fuel costs made possible by intelligent supervision."

In discussing this paper, Secretary Diven was of the opinion that college men stay for such a short time that it hardly paid to keep a chain of them going, but better to employ a man who would not be so ambitious and specially train him for the work. Professor Dallyn, of Toronto, however, defended the use of graduates, believing that with even a brief stay they would give better results than men not trained for this special work. Mr. Kimball stated that in one case a small plant had used a graduate at \$60 a month, advancing him later to \$100, but acting under the advice of a consultant and saving more than his salary to the plant. He recommended the combining of several plants (from six to twenty-four

even) under the supervision of one man, as has been done by him in the cases of plants operated by his company.

Discussion then turned to the subject of having daily reports sent to a consultant. Mr. Kirstein, of Rahway, said that their pump engineer used chemicals and followed instructions given by an expert and sent daily postcard reports of bacterial tests to the expert; also samples once a week. Mr. Taylor stated that the Pennsylvania State Board of Health required his plant to send weekly samples to its chemist and bacteriologist for approval. Mr. Caird believed that changes in the water were so rapid that daily samples were necessary. He admitted that sending samples might be risky, especially as superintendents might select the samples improperly, or might use hypochlorite on them. Professor Dallyn said that sending samples was nonsense, and no safe judgment could be deduced from them; that the condition of the plant was the important matter, and that this should be examined by a central health bureau. One thorough examination for a full twenty-four hours he believed to be more valuable than a year of weekly tests.

THE USE OF THE NITRITE TEST IN DETERMINING THE SOURCE OF POLLUTION OF A WATER SUPPLY.

By WILLIAM MILLER BOOTH.

The object of this brief paper was to show how the nitrite test had been used by the author in tracing a source of pollution. It was accompanied by a table of 129 analyses, intended to show the relation between the nitrates and the existence of the source of probable pollution in a number of cases of springs, wells, streams and lakes. In the instance in question, the author, who has for some time made occasional analyses of a certain water supply as a matter of record, found the nitrites unusually high, accompanied by high ammonias and colonies of bacteria on gelatine. A simple drive well was driven about 8 feet into the ground at numerous points around the wells from which the supply was drawn, and tests for nitrite made on the water pumped from these. By noting which wells showed the highest nitrite, he was able to locate a large amount of decomposing animal matter. The nitrite in the waters from the several wells varied from nothing and .002 to as high as .046 and .044, the latter being found near the putrifying matter referred to.

INVESTIGATION INTO ADVISABILITY OF SUBSTITUTING AGAR FOR GELATIN AS A MEDIUM FOR DETERMINATION OF BACTERIAL COUNTS IN WATER ANALYSIS.

By W. U. C. BATON.

The author, quoting the recommendation of the committee of the American Public Health Association appointed to revise the standard methods of water analysis, that "the standard medium for determining the number of bacteria in water shall be nutrient agar. All variations from this shall be considered special media", stated that he was not ready to subscribe to this, and that a protest has been made against it in a vigorous manner by various men interested. Whipple reported that, of 18 replies from 20 leading filter operators, the large majority preferred gelatin or were unwilling to express an opinion until they had tested the two media comparatively. The author, since the publication of the committee report, has been acquiring data to either justify or disprove the wisdom of the change. His previous experiences with agar for determining the number of bacteria in water had not been encouraging. Work was begun in October, 1912, and has been continued to the present time. In all some 1,898 samples had been tabulated during the pe-

riod of sixteen months up to February 1, 1914. The author presents four pages of tables giving the results of these analyses in the form of a comparison of gelatin and agar counts for various coli conditions, the figures giving monthly averages for various classes of water. Another table gives averages for the sixteen months showing a comparison of counts in 10 c. c., 1 c. c., 1/25, 1/50 and 1/100 c. c. These averages show the gelatin counts as being from three to fifteen times greater than the agar. His general conclusion is that there is no fixed definite relation between the gelatin and agar results. There are certain apparent relations, but they show more exceptions than rules. They vary seasonably and with the classes of water.

"There is practically no difference in the ease or difficulty with which the two media are made up. The agar at 37° C. has apparent advantage in that it will give a count at the end of twenty-four hours. On the other hand, it has the disadvantage of giving many lost results due to troublesome spreaders even with the porous cover dishes. The writer finds that the loss by liquifying of the gelatin plates is frequently nil, hence the results on gelatin, while they take longer, are more certain. It has been the writer's experience that the gelatin count will frequently indicate conditions which would never be shown by the agar 37° count alone; such conditions as an abnormal fluctuation in a reservoir, breaks or other abnormal drafts on pipe lines, abnormal growths in underdrains, springs and wells sensitive to local rains through shallow drainage and other similar problems which many have doubtless encountered." The agar count on the better class of waters is so low that a fluctuation of 5 or 10 per c. c. is noticeable, and yet it would take considerable audacity to give a positive interpretation to such a small fluctuation.

"100 per c. c. or less on gelatin at 20° is the often quoted German standard for good water. * * * The agar at 37° count which corresponds to this is probably somewhere between zero and 100, but where? The writer has not the courage to fix the standard from any data in his possession."

"In conclusion, the writer wishes to add his word of protest against the replacing of gelatin 20° C. counts with agar 37° C. counts as standard procedure in water analysis. If it is possible to make only one count, the gelatin should be used as it is more reliable and serviceable. If possible, both gelatin counts at 20° C. and agar at 37° C. should be made, as it gives to the experienced man more data for his diagnosis and points will often be brought out more completely when we have the two counts."

THE DUAL SYSTEM OF DISTRIBUTION.

By HENRY C. HODGKINS.

The author referred, with several figures to illustrate, to the enormous increase in the amounts of water which are being demanded by American cities, and the increasing difficulty of obtaining these amounts. But the amount required for culinary and drinking purposes will amount to from 3 to 5 per cent. of the total consumption. The amount of potable water thus required is very nearly a constant quantity from day to day. Filtration plants cost from 12 to 20 per cent. of the total cost of the remaining portion of the water works in the case of mechanical filters and 20 to 30 per cent. in the case of slow sand filters. In a city of 100,000, Leonard Metcalf estimates the cost of that portion of a distribution system due to domestic consumption at 22 per cent. of the total cost. If the division is carried farther, that portion due to culinary and drinking purposes would be about 4 per cent.

"If the distribution system could be separated into distinct systems and at the above proportionate costs, the problem of dual systems will be easy." The author believes that a separate system for potable water only would cost 25 to 30 per cent. as much as the ordinary distribution system; or from 70 to 150 per cent. of the cost of a filtration plant. The cost of filtered water, allowing for maintenance, interest and depreciation, would probably fall between 1 cent and 1½ cents per thousand gallons. Assuming it as 1.2 cents per thousand gallons, the cost per million gallons would be \$12, but 40,000 gallons would be sufficient for culinary and drinking purposes, and this would cost but 48 cents, a saving of \$11.52 per million gallons. The interest, depreciation and maintenance of the dual system in a medium size city would require not to exceed half of this saving, leaving \$5 or \$6 saved by the dual system. The pure water in a dual system should, he thinks, sell at a much higher rate than the raw water, both to cover the higher cost of providing it and also to prevent the use of the pure water for other purposes than those intended.

He does not claim the dual system should be universally adopted, but in places where there is a supply of naturally pure water sufficient to meet the culinary and drinking purposes, it is urged that it be supplied through a separate system, leaving the larger requirements to be furnished from the nearest and cheapest source of reasonably clean water. Certain towns may have outgrown their present water supply which is excellent in quality but insufficient in quantity. In this case the old supply could be used for the pure water and a more convenient but less pure water used for the other purposes.

"The great argument against the dual supply has been the difficulty of controlling its use. It has been argued that poor people would use the cheaper water, and that many, especially new arrivals in the city, from ignorance, would use the contaminated water. Every precaution should, of course, be taken to prevent the wrong use of either water. The drinking faucets should be of one handsome ornamental design properly labeled. All other faucets should be of the same and an entirely different and distinctive design. Greater care and inspection of all fixtures would be necessary, which would certainly be progress in the right direction."

In discussing this paper, Mr. Chester stated that he did not consider the dual system practical in more than one case out of a hundred. In Pittsburgh, the various industries to a large extent pump water for their use directly out of the river, and to this extent that city already has a dual supply. An important argument against the dual system was the fact that purification of the commercial supply was often necessary, such as softening, deferrization, etc.

Mr. Diven stated that the saving in cost of filtering the small potable supply would not be as great as the author had stated, since the cost per million gallons would be higher for such a small plant than for the larger ones.

Mr. Maignen favored the dual supply. He stated that Camden, N. J., was already considering such a supply, since the city was now using about all the water which could be obtained from wells, whereas the industries could obtain water for their use from the river, clarifying it by filtration or otherwise, if necessary. Paris, said he, has a dual supply and charges four times as much for the pure as for the impure water.

Mr. Kimball referred to the well-known instance of Lawrence, Mass., where, when filtered water was first introduced, the factories used different styles of faucets

for filtered and unfiltered water, painted the appliances different colors, etc., and even imposed penalties for drinking the raw water; but the operatives insisted on drinking it if the raw water faucet happened to be nearer or in other ways more convenient for them, with the result that it was found impossible to entirely exterminate typhoid fever until all the river water had been removed from the factories.

SOME OBSERVATIONS ON THE EFFECT OF OZONE ON ALGAE GROWTHS.

By S. T. POWELL.

This paper gives the conclusions drawn from certain tests made in connection with experiments on the use of ozone for purifying water which the Baltimore County Water and Electric Company had been carrying on for the past five years. It was noticed very soon after putting the plant into operation that a foamy greenish scum collected on the surface of the water and increased in thickness. Under the microscope this was seen to be an accumulation of algae which had been carried to the surface of the water by the adherence to them of bubbles of ozonized air. The ozone appeared to have a disintegrating effect on many of the organisms. This led to an investigation of the subject. Samples of swamp water were ozonized for half an hour, and under the microscope there appeared to be a general disintegration of all the organisms containing chlorophyll, which were killed except where they were massed in bunches. The chlorophyll itself was released into the water, and the ozone had little, if any, effect upon it. Diatoma, crustacea and protozoa were unaffected. A sample of water was set aside for twenty-four hours, and by this time the crustacea and protozoa were all dead, the color of the water had increased and there was a decided increase in the odor. The killing of the crustacea was probably due not to the oxidizing effect of the ozone but to the removal of the food supply by sterilization of the water. The color and odor increase was caused by the scattering of the chlorophyll and oil globules through the water when the organisms were broken up.

An attempt was made to determine the effect of ozone in removing odors arising from algae growths, and it was found that where the water contained living micro-organisms the odors were intensified rather than decreased, owing to the disintegration of the plant. The oily substances themselves were acted upon only after complete oxidation of the organic matter present. To further study this subject, a number of substances that impart distinctive odors were mixed with samples of tap water, and the deodorizing effect of ozone upon them was noted. Such substances as oil of rose, oil of heliotrope, of cloves, of wintergreen, of peppermint, and of violets, mercaptan, etc., were used in these experiments. A solution of tannic acid was greatly increased in color and odor by two minutes' ozonization and a concentration of 0.2 gram of the gas. This condition is one of considerable importance as it demonstrates one of the serious difficulties of color removal encountered in the operation of ozone sterilization.

The author's conclusion from these experiments were that the ability of ozone to remove or reduce certain odors arising from substances dissolved in water is one of great importance. There is no doubt that ozone is a powerful deodorizing gas under certain conditions and when brought into direct contact with the substance for a sufficient period. Its deodorizing value depends upon the oxidizability of the substance treated and concentration of the gas, as well as the thoroughness of the mix.

PRESENT DAY WATER FILTRATION PRACTICE.

By GEO. A. JOHNSON.

This paper was one of the two longest presented to the convention, the other being a description of the Croton water supply by George W. Fuller. Mr. Johnson began with a history of filtration abroad, followed by that of United States cities, the latter beginning in 1875 with the Poughkeepsie slow sand filter. He gave a brief description and statement of the operation of most of the larger filters, both slow sand and rapid, which have been constructed since that time. These included the slow sand filters at Lawrence, Mass., Albany, N. Y., Washington, D. C., Philadelphia, Pa., and Pittsburg, Pa. The rapid sand filters specially described were those of Little Falls, N. J., New Orleans, La., Cincinnati, O., Louisville, Ky., and Columbus, O. In this connection he gave a list of all the filter plants, both slow and rapid, which have been constructed in the United States. Space does not permit more than a gleaning of a few of the more interesting statements from the paper. Most of the plants referred to have already been described in Municipal Journal. The author seemed to have a leaning toward the rapid sand filter and this was referred to by a number of the members in discussing the paper.

Concerning the Philadelphia plant, he stated that when the turbidity of the Delaware river exceeds 100 parts per million for prolonged periods, the Torresdale plant is utterly unable to cope with the problem. The pre-filters fail to do their proportion of the work and the slow sand filters choke badly and allow fine silt to pass to a depth as great as ten inches.

Concerning the Pittsburg filters, he stated that actual experience with them had failed to confirm the judgment of the filtration commission in adopting slow rather than rapid sand. The bacterial efficiency was poor and on one day in December, 1909, 120,000 bacteria per c. c. were found in the filtered water, and the use of hypochlorite was begun. This plant, he said, was watched more carefully than almost any other in existence, and this more than anything else prevented the signal failure of the plant, but it required a high grade of technical skill to enable the works to handle this, the most difficult water which a slow sand filter plant is called upon to purify in this country. The problem was studied during 1910 and 1911, as a result of which, preliminary filters and latitudinal baffles were built, this work being practically completed last December and there still remaining to be installed appliances for introducing coagulating and correcting chemicals. In spite of these difficulties, the use of the filtration plant has reduced the typhoid fever rate from an average of 125 per 100,000 for the nine years before filtration to an average of 10 for the four years succeeding filtration—a result never equaled in the history of water purification.

The first municipal rapid sand filtration plant was built at Somerville, N. J., in 1885, and up to January, 1914, more than 450 municipal plants of this type had been built or were under construction, with a total daily capacity of 1,745,000,000 gallons and twelve million people supplied. About 1900 the type of construction changed abruptly from circular wooden or steel tanks to rectangular concrete tanks. The plant at Little Falls, N. J., was the first one built wherein the tanks were of rectangular concrete construction, this being completed in 1902. In numerous respects all of the rapid sand filter plants built since then have been patterned after this with respect to the scheme of layout and the automatic or easily manipulated hydraulic and electrical contrivances. This plant serves several cities, the largest of which is Paterson, and the average death rate from

typhoid fever in this city for the five years prior to filtration was 32, which was reduced to 9 for the ten years following filtration.

In the New Orleans, La., plant, lime and sulphate of iron are used as coagulants and the filters are cleaned by water alone under high velocity. The amount of wash water used averages the very low figure of 0.4 per cent of that filtered, this being due to the very complete preparatory treatment of the water in sedimentation and coagulating basins prior to its application to the filters. The use of the filtered public supply has been taken up very slowly by the citizens, only about one-half of the population being connected at the end of 1912. Also the introduction of a new sewerage system and other sanitary improvements in the city make it uncertain how much should be credited to the water supply. In 1912, however, the typhoid fever rate was 58 per cent less than for the thirty years previous to filtration.

The Cincinnati plant is the largest rapid sand filter in the country, although those under construction at St. Louis and Baltimore are larger; the Cincinnati plant having a daily capacity of 112 million gallons, Baltimore of 128 million and St. Louis of 160 million. In Cincinnati the raw Ohio river water is first allowed to settle for about three days in a large reservoir, coagulant is then added and from two to three hours allowed for coagulation and supplementary sedimentation, and the water is then applied to the filters. Three and a half per cent of wash water is used. The turbidity is reduced from 190 to zero, the bacteria from 8,900 to 75, these being averages for the year 1910. The typhoid fever rate has been reduced from an average of 55 for the eight years previous to filtration to 11 for the five years following.

The Louisville, Ky., plant was placed in operation in 1909. The wash water used averaged 2.37 per cent during 1911, and the turbidity was reduced from an average of 225 to zero and the bacteria from 10,300 to 135. The typhoid death rate was reduced from 56 for the ten years previous to filtration to an average of 25 for the three years following.

The Columbus, O., plant was put into operation in 1908, and it is designed to soften the river water as well as to clarify and otherwise purify it. This water is not only frequently muddy, but is one of the hardest in the country. The average amount of chemical used in 1911 was 7.5 parts of lime, 4.3 of soda ash and 1.57 of sulphate of alumina. On the average the turbidity was reduced from 68 to 0, hardness from 245 to 84, alkalinity from 150 to 45, inclusions from 45 to 38 and bacteria from 11,470 to 55. The typhoid death rate has been reduced from an average of 62 for the nine years preceding filtration to 17 for the four years following.

Concerning the use of coagulants, Mr. Johnson states that the chemicals most commonly used are compounds of aluminum and iron, of which potash, alum, sulphate of alumina and sulphate of iron are those most extensively employed. The essential feature in selecting chemicals is that the chemical shall be basic, namely, that it shall contain more available alumina or iron than is required to combine with dissolved sulphuric acid, and that it shall contain no free sulphuric acid.

Under some circumstances the carbonic acid liberated by the application of chemicals increases somewhat the rate at which the water corrodes some unprotected metals, although no more so than the best ground water supplies of the country. The carbonic acid may be removed by the addition of lime. For ordinary uses no change as regards hardness due to coagulants can be detected, but where water is boiled or used for steam raising purposes, it is a little less satisfactory after coagu-

lation on account of the increased amounts of incrustants, although the increase is very small.

To obtain satisfactory results from the use of lime and iron as coagulants, it is necessary to add sufficient lime to neutralize and precipitate the iron. This must be done carefully, for the use of too little lime results in poor coagulation caused by the incomplete precipitation of iron, some of which may appear in the effluent of the coagulating basin, while too much lime causes incrustants to form, which are liable to cause trouble by being deposited in the sand bed and in pipes and valves.

Where waters are very muddy it is desirable to precede the filtration by sedimentation, and if this is to be aided by preliminary coagulation the sedimentation basins must be sufficiently large to permit of adequate subsidence of coagulated matter before the water reaches the filters. Otherwise, the filters will clog too quickly and require too frequent cleaning. The basins should be well baffled and have a capacity of 18 to 24 hours' flow, or several days' flow if not well baffled. The use of coagulants in this way before applying water to slow sand filters is quite successfully practiced at Springfield, Mass., Ferncliff and Poughkeepsie, N. Y., Indianapolis, Ind., Washington, D. C., and elsewhere.

Concerning the so-called red water plague, Mr. Johnson states that where sulphates of iron or alumina are used in the preparation of water for filtration and lime or soda are not also used, there is an increase in the amount of carbonic acid of three to four parts per million for each grain of coagulant used per gallon of water, and this free carbonic acid increases the corrosive action of water on metals. He disputes, however, the claim made that coagulating water is responsible for the more or less common run of red water troubles, but believes that these would in most cases be experienced without coagulation.

Concerning the costs of slow and rapid sand filters, he makes a comparison including in each case the buildings, filters and all appurtenances, preliminary sedimentation basins, filters and clear water reservoirs. The greater area required for slow sand filters makes the land required cost about twenty times as much as for slow sand, and furthermore makes it more difficult to find a site for the filters without going long distances. He presents a table of costs of seven slow sand filters and eight rapid sand filters, the construction costs given by him ranging from \$20,000 per million gallons daily capacity to \$45,200 for slow sand filters, and from \$10,300 to \$15,000 for rapid sand filters, the averages for the two sets being \$32,600 and \$12,100 respectively. At 5 per cent., the fixed charges on these sums would amount to \$4.47 and \$1.66 respectively per million gallons filtered. He likewise gives the cost of operation and maintenance of the seven slow filters and of five rapid filters, the former varying from \$1.91 to \$5.62 per million gallons filtered, and the latter from \$3.20 to \$6.32, the averages being \$2.86 for slow sand and \$4.04 for rapid sand. Adding these two cost figures, we have a total of \$7.33 per million gallons for slow sand filtration and \$5.70 for rapid sand.

Concerning the relative efficiency, he claims that well designed and built rapid filter plants not only can purify water of any character, turbid, colored or clear, so that the filtered product will always be clear and colorless, but also are less liable to show sharp diminution in bacterial efficiency in cold winter months or when the character of the raw water is seriously contaminated with certain industrial wastes. "Wherever chemicals are or should be used in the preparation of water for filtration, it is proof that the slow sand filter is out of its element

and in a field which, on grounds of economy at least, belongs exclusively to the rapid sand system." He compares the reduction in the typhoid death rates by seven slow and six rapid sand filters, and finds that the average rates after filtration are 22 for the slow sand filters and 16 for the rapid sand. He uses this as an argument in favor of rapid sand, but fails to call attention to the fact that the average rates before filtration were 81 in the cities where slow sand filters were built, and only 44 in those where rapid sand filters were adopted; a comparison of these averages showing that while the slow sand filters reduced the death rate by 73 per cent., the rapid sand reduced it by only 64 per cent.

The lists of cities having filters, population supplied with filtered water, etc., are of considerable interest, and we will probably publish these in a later issue.

In discussing this paper, the point which received the most attention was the comparative costs of filters, and it seemed to be the general, if not universal, opinion that the author had not made a fair presentation of this question; that is, the figures given for slow sand were too high and those given for rapid sand much too low. The discussion was opened by J. H. Gregory, who stated in substance that land for slow sand filters was not often difficult to obtain, and that quite commonly it was found as cheap to purchase an area large enough for a slow sand filter as to obtain a smaller portion of a tract sufficient for the rapid filter only; citing as instances, Pittsburg, Philadelphia and New York, several sites being found by the latter city for filtering the Croton supply and also in the Catskills for the new supply. At Cincinnati land was found equally available for either slow or rapid filters, also at Columbus, and at the latter city sufficient area was taken for slow filters, although rapid ones were used.

The cost, Mr. Gregory said, depends largely on the capacity of the coagulating and clear water reservoirs. These were nine times as large in New Orleans as at Little Falls, which accounts largely for the difference in cost. At Philadelphia the puddling of the filter walls and other special construction (and politics, said John Trautwine, Jr.) made the cost higher. At Montreal the cost of slow sand filters averaged only \$22,630 per million gallons, including a low lift pumping station, or \$21,000 without the pumping station. The cost of the Columbus plant was between \$14,000 and \$15,000 and not \$13,000 as stated by Mr. Johnson. Other rapid sand filters were those at Toledo, O., costing \$14,500 or more; Grand Rapids, costing \$16,300, omitting items not chargeable to the filters. At Cincinnati the settling basins should be included as part of the plant, and including half the cost of these, gives the cost per million of \$18,200 instead of \$11,400 given by Mr. Johnson. The New Orleans plant cost only \$30,160 if the non-filter structures be omitted. The weighted average of the several plants referred to by Mr. Gregory gave \$18,600 as the average cost of rapid sand filters instead of \$12,100 of the author; and these are all the latest and best plants of this kind. The author's figures were not only much too low for rapid sand, but were too high for slow sand filters.

J. N. Chester agreed with Mr. Gregory's conclusions in a general way, and stated that the cost of the modern large rapid sand filters was more per million gallons than the small, because more conveniences in the way of appliances for controlling the filters were being demanded. He stated that he built the third slow sand filter in the United States at Mount Vernon, the cost for 1.4 acres being \$22,000, but this was built by damming off a reservoir and filling with sand which was dug on the spot. Rapid plants could be built cheaply, he said, by using wooden

tanks, wrought iron pipe, etc., but cost of operation and depreciation would be high. On the other hand, \$2,000 to \$6,000 per million gallons is often put in a head house, administration building, hydraulic valves, etc. R. S. Weston agreed with Mr. Gregory as to the matter of cost. Some time ago he fixed upon \$14,500 per million as the average cost for a rapid filter and \$100,000 per acre as the average for a slow filter, and believed that the latter could be used at the rate of six million gallons per acre if hypochlorite be used for sterilizing. R. E. Milligan cited Jerome Park as a proof that large plants need not necessarily cost more per unit than small.

C. B. Burdick called attention to a common error in assuming that a plant operates at 100 per cent. of its capacity every day, stating that in practice the actual capacity was but 40 per cent. to 85 or 90 per cent. of the theoretical. Allowance for this would raise the cost per million gallons filtered. H. C. Hodgkins considered that 8 per cent. rather than 5 per cent. should be allowed for the fixed charges.

Mr. Weston said that the Pittsburg and Washington filters should have been rapid sand, while Mr. Chester said that Pittsburg was just on the limit of turbidity where this was a question. Mr. Weston set the limit of turbidity at 30, and the limit of color at 50, above which rapid filters should be used. He agreed with Johnson that rapid filters should be used under many conditions, but advocated slow filters for clear water and where sand and construction costs were low.

Mr. Milligan advocated rapid filters at a 240-million gallon rate for removing iron instead of slow filters at a 10-million gallon rate. He also believed that pressure filters would again become popular, with the effluent probably sterilized. Paul Hansen thought pressure filters should be adopted with caution, as they do not allow of coagulation and sedimentation prior to filtration. Mr. Chester agreed with Mr. Hansen in opposing the use of pressure filters, one objection being that he has always found unwashed sand in the bulge of horizontal cylindrical filters.

W. C. Hawley stated that if the decision was to be made to-day, Pittsburg would probably adopt rapid filters, briefly describing other rapid filters recently built by private plants just above Pittsburg.

Mr. Chester believed that eighteen to twenty-four hours' flow should be considered a maximum size rather than an average for the coagulation basin for slow sand filters. As to red water, he said that it was necessary to use lime every year in Pittsburg to prevent this.

Professor Dallyn did not consider the total death rate of any value as a basis of comparing improvement in health conditions due to water, unless the infant rate was excluded, since this was a very large percentage of the whole, and usually depends upon the milk supply rather than upon the water supply.

DIAGRAMMATIC METHOD OF DETERMINING COST PER FOOT OF CAST IRON PIPE.

By W. E. MILLER.

Since the costs and values of cast iron pipe are usually wanted in terms of dollars and cents per lineal foot, and the purchase is usually made on a tonnage basis, it has heretofore been necessary to make calculations of the costs per foot every time such a figure is wanted.

A straight edge and the accompanying diagram, if kept handy, will be a very convenient and satisfactory means of quickly obtaining the cost per foot of any common size of cast iron pipe in the American Water Works Association classes A, B, C and D, from any price per ton.

The diagram is mathematically constructed on log-

arithmic scales. The results sought may be read direct on the central scale by the straight edge laid across the price per ton on the left hand scale, and the size and class on the right hand scale.

In using the right hand scale care should be taken to use the points on the vertical

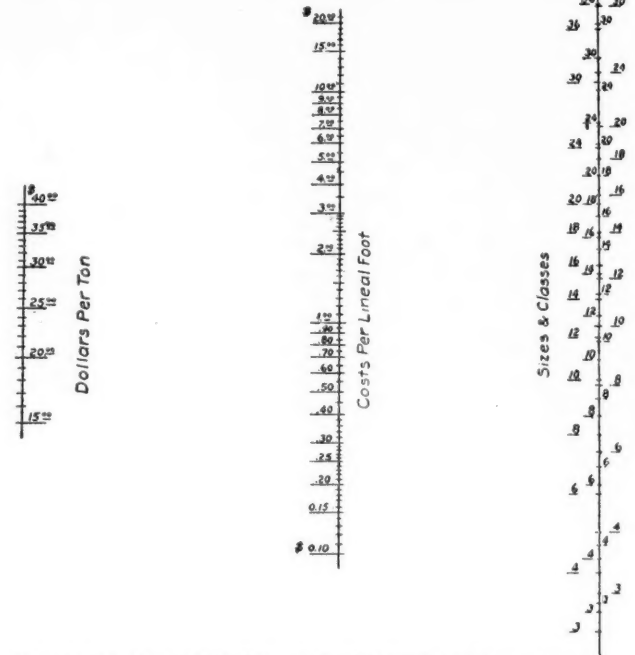


DIAGRAM OF COSTS OF CAST IRON WATER PIPE.
American Water Works Association Pipe Classification.

line, not the numerals to the left and right of it. It will be noted in this connection that the size numerals each occur four times and are arranged in four columns under the class letters, and are opposite the proper points on the vertical scale.

TESTING CHECK VALVES.

By J. WALTER ACKERMAN.

The valves referred to by the author were some installed three or four years ago on private fire service connections to prevent auxiliary fire supplies of impure water from finding its way back into the city mains of Auburn, N. Y. The valves are of a special design, and several valve manufacturers can furnish similar valves endorsed by the fire underwriters. The pipes within the property carrying pure water are required to be painted blue, those used exclusively for fire protection, red, and those carrying impure water, yellow.

These valves are tested every six months by the water department and taken apart once a year and examined for defects or obstructions, a representative of the Association Factory Mutual Fire Insurance Company being present at the latter examination. The inspections and tests are made at the expense of the factory or mill. On each service there are two gate valves and between these two check valves, each of the latter being provided with a pressure gauge and a small drain pipe, while a third pressure gauge is inserted in the pipe between the upstream gate valve and the first check valve. By manipulating these valves and watching gauges, it is possible to determine the tightness of each of the checks and also the sensitiveness of its action. If the check is not tight it is usually found that the rubber facing on the clapper is coated with slime or contains small indentations. The interior of the checks are examined to determine actual conditions, such as tuberculations on the iron body, smoothness of seat ring, condition of the rubber facing on the clapper, and manner of closing of the valve.

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CHANGE OF ADDRESS

Subscribers are requested to notify us of changes of address, giving both old and new addresses.

Contributions suitable for this paper either in the form of special articles or of letters discussing municipal matters, are invited and paid for.

Subscribers desiring information concerning municipal matters are requested to call upon MUNICIPAL JOURNAL, which has unusual facilities for furnishing the same, and will do so gladly and without cost.

MAY 28, 1914.

CONTENTS

Disinfecting Philadelphia's Water Supply. (Illustrated). By Francis D. West.....	771
Papers before American Water Works Association:	779
Sewage Pollution of Boundary Waters. By A. J. McLaughlin	779
Use of the Nitrite Test. By W. M. Booth.....	780
Substituting Agar for Gelatin. By W. U. C. Baton..	780
The Dual System of Distribution. By H. C. Hodgkins.	780
Effect of Ozone on Algae. By S. T. Powell.....	781
Present Day Water Filtration Practice. By G. A. Johnson	782
Cost Per Foot of Cast Iron Pipe. (Illustrated). By W. E. Miller.....	784
Testing Check Valves. By J. W. Ackerman.....	784
Water Purification Methods.....	785
Do Meters Under Register?	785
Municipal News. (Illustrated).....	786
Legal News—Notes of Recent Decisions.....	792
News of the Societies.....	793
New Appliances. (Illustrated)	795
Industrial News	797
Personals	798
Contract News	799

Water Purification Methods.

The papers read this month before the convention of the American Water Works Association reflect the lines along which the investigators and thinkers among water works men are directing their energies, and the progress which they have made. It is significant that of the eighteen papers read, nine dealt directly with water purification or analysis, and four of the others devoted more or less of their attention to the subject.

The predominance of papers on quality, however, is somewhat misleading. Questions connected with quantity have been solved to a large extent, or are being solved by purifying hitherto unacceptable waters; while treatment methods are in process of solution, and there are more developments and unsolved questions involved. Pumps, reservoirs, pipe lines, yield, etc., are even more important than ever as the unit value of water increases, but methods and designs for these are pretty well standardized.

In treatment, on the other hand, there is constant change and latitude of choice. We have sedimentation with or without coagulation; slow or rapid sand filters,

with or without sedimentation; softening by the old and by newly invented methods; removal of iron and other matters in solution; disinfection by hypochlorite, liquid chlorine, ozone, ultra-violet rays and a number of other more or less proven methods. And the last few years have seen and the next few will see important changes to each of the forms of treatment named, and probably new ones will be added.

In the matter of disinfection (sometimes called sterilization) methods caution is advised. Because a method is scientifically feasible and has worked well in a laboratory is not sufficient reason for adopting it at considerable expense for the important work of safe-guarding the health of a community. It should first be tried out by unprejudiced experts in a practical experimental plant, or by some town which is willing to be the "dog." Nine years ago the writer had difficulty in persuading a water company not to adopt ozone treatment, which was urged by one of the directors, a physician; and the use of ozone is not yet upon a commercial basis, if it is upon a scientifically, practical basis.

Of the effectiveness of hypochlorite there can be little doubt, and no reason why any city should hesitate to use it under the advice of an expert, although there is undoubtedly something yet to learn in the way of eliminating certain objections. Liquid chlorine seems to have proved its right to consideration, although there are some mechanical and physical features of its use which are open to improvement. Of the ultra-violet rays we can speak less positively, as to either their effectiveness or the cost of treatment. The scientists who are studying the matter are at least honest and sincere, and are entitled to commendation and encouragement in their efforts to devise practical methods of applying the idea.

With these various methods, some already developed, others in process of evolution and still others (not mentioned) which hold forth little promise, and all with active advocates, the wise course for any official is to refuse to decide upon any without the advice of an expert—one who follows closely all developments along these lines and possesses the ability and judgment to appreciate their true worth, and who is as far as possible unbiased for or against any method, new or old.

Do Meters Over-Register?

Do domestic meters ever over-register? The average consumer and the manufacturer would each ridicule the very asking of such a question, but for diametrically opposite reasons. But the question was asked at the water works convention, and a dozen or more meter men listened while an equal number of superintendents discussed it. The latter probably represented experience with a million meters, and the searching of memories to produce instances of over-registration of domestic meters, while they were not fruitless, conveyed the impression that such a meter was as rare as a white crow—there are albino crows, but few ever see them.

One or two believed that where water left deposits on discs, plungers or other parts which would contract the water way, meters would be made to over-register; but others claimed that these same deposits would tend to retard the motion of the disc and this would more than offset the lessened capacity. Deposits also formed in one make of meter whose casing was of cast iron. Then there were instances of wrong spur wheels in the gearing.

But when it is considered from how great a number of meters, of all makes, prices and conditions of maintenance, these few illustrations were drawn, and that most meters under-register on small flows, it must be evident that that superintendent was conservative who offered a suit of clothes to any consumer whose meter over-registered.

The WEEK'S NEWS

New York State Highways—Street Widening in Providence, R. I.—Cities and Counties Buy New Equipment—Big Sewer Work in Passaic, Pittsburgh and El Paso—Milwaukee Typhoid Decrease—Progress of Metering—Baltimore (Md.) Motorizing—Hartford's New Pump—Garbage in Schenectady—Survey of New York State Cities.

ROADS AND PAVEMENTS

Sandstone for New York State Highways.

Rochester, N. Y.—Commissioner of Highways John N. Carlisle, on a trip of inspection to Medina, announced that convict labor would begin work by July 1 quarrying sandstone between Medina and Brockport for highway purposes. The state purchased the land on which the quarries are located for barge canal purposes. Mr. Carlisle said the steam shovels at work on the Barge Canal piled the sandstone up along the canal line and that much could be obtained without quarrying. Sandstone will be used on the Ridge Road. Medina sandstone roads, he said, were the best, with brick and concrete next. Macadam roads were doubtful, he thought, because they would not stand up under heavy traffic.

Contract-Letting Record.

Indianapolis, Ind.—Members of the board of public works believe they have established a new record for the first four and one-half months of a city administration in the number of improvement contracts the board has let since it took office January 5. The board has let seventy-five contracts aggregating \$280,281.38. Of these contracts, twenty-six have been for paving streets and ten for building sewers. The remainder of the contracts are for curbing, grading, graveling, cement walks and approach walks.

Extensive Street Widening.

Providence, R. I.—Three street-widening reports demanding a total expenditure by the city of \$2,000,000, if carried out, are soon to be presented to the Board of Aldermen. The reports will come from street commissioners who have been at work obtaining damage agreements for considerably more than a year. The actual cost to the city in damages and work on the three highways cannot be accurately estimated at this time, but, according to city officials, it will total \$2,000,000. All three of these proposed improvements were undertaken by the city on recommendation of Bion J. Arnold, and are intended to facilitate the handling of traffic in the busy districts where they are located.

Shell Paving for Houston Suburb.

Houston, Tex.—All the streets in Central Park, a suburb of Houston, will be shelled. The work began last month and has gone forward as fast as material could be received. This will complete the loop of shell-paved streets connecting the southern portion of the park, where most of the streets are already shelled, with all the shelled streets in

the northern portion. The entire contract amounts to 48,000 square feet of cement sidewalk. The illustration shows the concrete mixer at work.



Courtesy Baltimore (Md.) News.

KEROSENE BURNING TRUCK FOR STREET OILING.

White Trucks for Oiling.

Baltimore, Md.—Three five-ton Whites, fitted with special steel tank bodies, will be used by the Good Roads Company of Baltimore for oiling streets and roads. They will be among the first heavy duty trucks in the country to be equipped with kerosene carburetors. One of these trucks is ready for use by the Good Roads Company. The trucks are equipped with the regular White carburetor, to which is attached a special electrical vaporizer, thus permitting the use of kerosene for the trucks.

Begin Work on 13-Mile Pike.

Greenville, Ala.—Work has been commenced on the Greenville-Honorville road. Equipment for camping and road building has already been placed at different points along the road. The highway when completed will be about 13 miles in length. There are now about 50 miles of good road in Butler county.

County Buys Road Engine.

Emporia, Kan.—A Case engine, made by the J. I. Case Threshing Machine Co., Racine, Wis., has been unloaded at Olpe, making the third tractor purchased by the Board of County Commissioners for use on the county roads. The big gasoline engine is being tried out and will be put into use at once. The engine is hitched to a 10-foot grader, and is smoothing off the roads in Commissioner N. S. Wendling's district. The new engine develops 25-horse power, weighs eight tons and costs the county \$1,875.

Tucson, Ariz., to Celebrate First Paving.

Tucson, Ariz.—The very democratic ball will be held in Tucson soon. It will be in celebration of the first paving. The paving will be the ballroom, a solid concrete base and an asphalt surface. To make it "faster" a wax preparation will be applied.

Sidewalk Obstruction Fight.

Pittsburgh, Pa.—Merchants whose stores are in the North Side business district of Pittsburgh have locked horns with the public safety department over the order that no steps or display windows shall be allowed to protrude beyond the property line into the sidewalks. The issue was raised by the First National Bank, which is erecting a white marble bank building. The architect's plans provided for several stone steps extending beyond the building line, two or three feet into the sidewalk. Director Charles S. Hubbard ordered the bank directors to remove the steps, as they were an obstruction on the sidewalk.



Courtesy Houston (Tex.) Chronicle.
CONCRETE MIXER AT WORK.

When protest was raised by the bank officials he issued orders for the removal of all sidewalk obstructions. The order affects a large number of merchants, and a fight will be made in the City Council to repeal the ordinance.

SEWERAGE AND SANITATION

\$200,000 Sewer Completed.

Pittsburgh, Pa.—Work is about completed on the new 33d street sewer built by the city of Pittsburgh to replace the one destroyed by a gas explosion last November. The job cost the city more than \$200,000. It involved the construction of 3,900 lineal feet of brick arch sewer, 142 feet of which is ten feet, and the remainder eight feet. One of the big items of the expense was the canal; the city had to dig to a big chute where it empties its large flow into the ten-foot sewer. This canal is 3,400 feet long, and is banked with two-inch planking. It is eight feet wide and ten feet deep. All the lower part of the big sewer was practically destroyed by the mysterious explosion, the cause of which has not yet been ascertained. A water main broke before the end of the work, and the flood of water that poured out threatened for several hours to ruin all the work the city has done in rebuilding the big sewer main. The big tunnel was flooded. Workmen were forced to flee for safety, but they made heroic efforts to save the big sewer. The water was shut off at the pumping station until danger of causing a collapse of the sewer was past. It tied up the Baltimore & Ohio Railroad and the street cars for more than two hours.

Progress on Passaic Trunk Sewer.

Passaic, N. J.—The first section of the trunk sewer to be built in this city has been completed and formally inspected by representatives of this city. The inspectors were satisfied with the work, and at the next meeting of the Trunk Sewerage Commission will recommend that the Donlon Contracting Co. of Brooklyn be paid the final amount of its contract. The city officials were headed by City Engineer Colin R. Wise and Commissioner of Public Improvements William R. Reid. Representatives of the contracting company, who led the trip through the big drain, said the many mishaps due to cave-ins caused by rains cost the contractors \$75,000 on the contract. They had considerable difficulty with the work in Hope avenue, where a large vein of sand runs for several blocks.

State Health Department Stops Sewer Work.

West Hazleton, Pa.—Work on the West Hazleton sewer jobs, for which a \$50,000 bond issue was approved by the voters, has been stopped by the State Department of Health. The cause for this action is that the municipality did not present the plans to the department for approval.

Chlorine Decreases Typhoid in Milwaukee.

Milwaukee, Wis.—Health Commissioner Ruhland in a survey of typhoid in American cities places Milwaukee third on the list of eight cities of 300,000 to 500,000 in reducing the typhoid death rate. From a death rate of 27.0 from 1906 to 1910, Milwaukee reduced the rate to 11.2. Dr. Ruhland said that the cause for this decrease here was undoubtedly the chlorination of the water supply—although the supply is still being contaminated by raw sewage in the lake.

Complete El Paso Sewers.

El Paso, Tex.—At a cost of approximately \$80,000, a saving of \$20,000, El Paso's deep sewer line has been completed and is ready for operation. The construction of the sewer has required one year. A year ago the preliminary work of building was started and the sewer was completed a month sooner than expected. The sewage system will meet all the requirements of a city of 100,000 population. It is figured that it will answer the purposes of El Paso for the next 15 or 20 years. The trunk line is exactly 18,000 feet in length. The average depth is 15 feet. The excavation for the sewer line was 15 feet in width. Three sizes of pipes were laid; 10,000 feet of 36 inch, 5500 of 30 inch and 2000 of 24 inch. In addition to laying the sewer, 63 manholes were constructed and in-

stalled. An average of 100 men a day were kept on the job until it was completed. An average of six teams were employed daily. The pipe for the line was manufactured here by the Bent Construction company of Los Angeles, Cal., which had the contract for building the line. Alderman W. S. Clayton, chairman of the street and grades committee, had entire supervision of the laying of the deep sewer. Due to this supervision and perfection of organization, a saving of \$20,000 to the city was effected. For the first 900 feet of the sewer line, quicksand and water were encountered. By the installation of pumps, which were kept going day and night, the water and sand were handled and the most difficult portion of the line was successfully completed.

Hundreds of Sewer Flood Suits Dismissed.

Brooklyn, N. Y.—An echo of the time when the city was the victim of fraudulent sewer overflow claims was heard in the Supreme Court, when 270 suits against the city were dismissed and 290 more were marked for the same fate. Assistant Corporation Counsel James T. O'Neil presented the orders to the court. With this big batch disposed of, Mr. O'Neil will have ended about 3,000 of these fraudulent claims, which represent a saving to the city of upward of \$2,000,000. There are still about 2,000 unsettled actions and Mr. O'Neil said that the work of getting rid of the suits was proceeding as rapidly as possible and would be until the last damage suit of this particular sort was disposed of. In the years 1904, 1905 and 1906 the overflowing of sewers in certain sections of Brooklyn presented very attractive chances to many lawyers in the city to collect heavy damages for clients from the city. The practice grew so lucrative to certain lawyers as to create a rush for this sort of claims.

WATER SUPPLY

One Hundred Per Cent Metering for Wilmington, Del.

Wilmington, Del.—The board of water commissioners has adopted a resolution ordering the installation of meters on all services supplied by Brandywine water as quickly as the work can be done. After the beginning of next year water will be furnished on a meter basis only and no new services will be installed except on that basis. \$50,000 have been received by Chief Engineer Hoopes of the water department for special work in installing meters.

Cities Have Right to State Streams.

Trenton, N. J.—Final determination of the suit in the Court of Chancery brought by Edmund Wilson, then the attorney-general of the state, against the East Jersey Water Company and others, relating to the diversion of potable water from the Passaic River, is given in an opinion just filed by Vice-Chancellor Stevens. One of the questions left for this final determination was whether the Legislature, from its various acts giving to municipalities a right to obtain a water supply, granted to them, has the state's right in so much water to be taken from the streams of the state as they may need for their lawful purposes. Deciding this point, Vice-Chancellor Stevens says that when the Legislature has authorized a municipality to procure a water supply it has granted the state's right in so much of the waters of the stream from which the supply is to be taken as the municipality may need. The other question decided is whether the East Jersey Water Company and those other corporations which are now engaged in bringing the waters of the Passaic to the defendant municipalities are the lawful agents for instrumentalities of the municipalities for that purpose. The act of 1888, Vice-Chancellor Stevens shows, authorizes the appropriate municipal authority to take and enter into a contract or agreement with any company for the obtaining or furnishing of a supply or a further or other supply of water. The suit was brought by former Attorney-General Wilson upon the information of the city of Paterson and others to enjoin the diversion of water from the Passaic River. The various municipalities in Hudson, Essex and Passaic counties who are supplied with water by the East Jersey Water Company and its connecting corporations were made part defendants to the action.

Profitable Municipal Plant.

Omaha, Neb.—The water commissioners have just issued a detailed statement of the eighteen months since Omaha took over the water system supplying Omaha and South Omaha. It shows that in this period water rates had been reduced 33½ per cent to consumers, and nearly \$500,000 net had been set aside as profits on the operation of the plant for the eighteen months. When the water system passed to control of the city it was under adverse circumstances and against public sentiment. The vote for municipal ownership had been overwhelming, but 10 years of expensive legislation found necessary to dislodge the private company caused a loss of support by thousands of former enthusiasts. The city expected to pay \$3,500,000 for the plant. It cost, instead, \$6,319,000. So unpopular did the idea become before the deal was consummated that the citizens refused to vote the necessary bonds, and it was only under the orders of the federal court that the bonding proposition was carried. When the plant passed to the city the rate to consumers was 35 cents per 1,000 gallons. After 18 months of city ownership the rate is 23½ cents per 1,000.

To Take Over Waterworks.

LaGrange, Ga.—At a meeting of the city council a deal was closed with the American Pipe and Construction Company whereby the present waterworks system passes into municipal ownership. This city will take over the plant on June 1. The bonds which were voted in 1912 for the construction of a municipal waterworks plant have been sold and the money will be used in making many improvements on the old plant. A new source of water supply will be purchased and the city of LaGrange will be given the advantage of a much better quality of water.

Cost of Hetch-Hetchy Water.

San Francisco, Cal.—That cities across the bay will be obliged to issue an excessive amount of bonds to derive a supply of water through the San Francisco Hetch-Hetchy system is the contention of opponents of the metropolitan water district proposition, according to a letter received by San Francisco's city engineer from the Alameda Improvement Club. Engineer O'Shaughnessy has compiled information as to the probable cost to the bay cities. He states that while no definite estimates have been made, it will cost between \$20,000,000 and \$30,000,000 to bring water as far as Irvington, where the transbay branch will come north. This sum will be proportioned according to the quantity of water taken by the different districts. Engineer O'Shaughnessy cites the case of Los Angeles, where water was brought 260 miles at a cost of but 10 cents per thousand gallons. Hetch-Hetchy, he says, is but 150 miles away, and San Francisco and the bay cities, having four times the wealth and experience of the southern city, should have no difficulty in solving the problem.

Inadequate Supply in Bloomington, Ind.

Bloomington, Ind.—The people of this city are again confronted with the question of an adequate supply of water. It is possible that Governor Ralston, who has already been consulted about the matter, will be called on to settle the controversy. Citizens differ as to the source of the new supply. Mayor Harris and his followers wish the present plant repaired and put in shape. The opponents of this plan contend that to do as Mayor Harris wishes done would be the useless expenditure of a large sum of money. They assert that at least \$75,000 has been spent on the plant and it is not in shape to give an adequate supply of water. At the present time the citizens of Bloomington are not permitted to sprinkle the streets or water their lawns. Bloomington is about up to the debt limit. It has not the money to put in a new plant. The city owns its plant and the sentiment here for municipal ownership is very strong. Several committees have been appointed, but they have all been divided on the question. The water supply has not had a very successful history. In 1901 a three-inch pump was put in to catch the water flowing away from the leaks and to repump it into the reservoir. About 1904 a sewage system was established in the city at about the same time, it is stated,

that the plant was closed down for nine days on account of lack of water. About 1907 a new dam was built downstream from the old reservoir in order to catch the leakage, forming what is known as the new reservoir. This reservoir also soon developed leakage, which has continually increased, so that since 1909 or 1910 it has been necessary to repump the leakage constantly. Besides the three-million gallon pump a two-million gallon pump is kept in reserve and used for repumping leakage when it becomes too much to handle in this connection. The shutdown of the plant last fall was a very serious affair. The railroads hauled water in tank cars and the industries had to ship water in. Expert engineers were employed and every one of them denounced the present system. Various methods were suggested for relief and none of them have been agreed on. There may be a water famine again this summer, and already much alarm is felt.

Water Company Protests Against City Plant.

Tarentum, Pa.—The town of Tarentum has fixed a rate of \$2.25 a quarter for each 7,500 gallons supplied by the municipal waterworks. There is a graduated rate for all water in excess of that, 10 cents for each 1,000 gallons being charged for all water in excess of 13,500 gallons in any one quarter. The Town Council proceeded with its plans for the water rates, despite the petition the Allegheny Valley Water Co. has filed with the State Public Service Commission, in which the company seeks to prevent the operation of the municipal water plant, on the plea that this will deprive the water company of its only source of revenue.

8,000,000-Gallon Pump Accepted.

Topeka, Kans. — The 8,000,000-gallon horizontal cross compound pumping engine, which cost the city \$5,361.91, has been tested, proved and officially accepted by the commission. According to the detailed report of Jesse Shaw, superintendent of the waterworks, the actual performance of the pump was better than that demanded in the city's specifications and the contractor's proposal. The pump was purchased of the Allis-Chalmers Manufacturing Co. Since its installation the pump, according to Mr. Shaw's report, has been in almost daily service, and responded perfectly to regular fire alarms. Under the most severe tests there was no undue vibration, no perceptible increase of strain. During an eight-hour test the pump handled 12,964,687 pounds of water.

Water Department Lowers Expenses.

South Bend, Ind.—Although in many instances the prices of materials have increased within the last year, the water works department under the present city administration is buying its materials much cheaper now than it did under the former administration, and will thereby save the city several thousand dollars this year. This was brought out through the report submitted to Mayor Fred W. Keller at the meeting of the department heads by the board of works, through John W. Toyne, superintendent of the water department. The comparison of prices for materials paid by the two administrations, as submitted to the mayor, is as follows:

	Paid in 1913	Paid in 1914
Water pipe, per ton.....	\$24.85	\$22.35
Specials, per ton.....	55.00	50.00
Hydrants, each	25.00	24.00
Jute, a cwt.....	5.50	4.00
Lead, a cwt.....	4.75	4.10
Service Boxes, each....	1.00	.80

Meters are being purchased at a 15 per cent. reduction, and service connections and valves at a 5 per cent. reduction. The department will this year purchase 400 tons of pipe, 2,000 pounds of jute, ten hundred weight of lead, 40 hydrants, 500 service boxes, besides a large amount of other materials specified in the list of comparisons. The total saving through the efficient buying will amount to not less than \$2,125, according to the city officials. The saving on pipe alone will be \$1,000. The materials are the same grade as purchased by the last administration, according to Superintendent Toyne.

Dead Body in Reservoir.

Concord, N. H.—Opinions differ widely as to the probable effect upon the water in Long pond, allowing a dead body at its bottom. Authorities at the state chemist's office state that decomposition would first set in in the body's interior, and that before it could spread to the outer portion it would come to the surface. This is, of course, allowing that the body is lying on the bottom of the pond, and not caught in one of the numerous natural traps known to form the coating of the pond's bottom. The official thought that imagination was responsible for the alleged contamination. While others take the same view, there are those who hold that the presence of the body would make the water entirely unfit for domestic use. Physicians are among those who share this latter belief. It is known that some families are already boiling their water, and for the one reason that the thought of a dead person lying in the city's huge reservoir is an unsavory one the consumption of water for domestic purposes is less than it has been for some time. The search for the body has gone on with a systematic determination, under the direction of the police and water departments, but have been entirely futile. The authorities are loath to use dynamite, but may be forced to if their continued attempts with the grappling irons prove futile.

STREET LIGHTING AND POWER

Bucyrus Light Case Decided.

Columbus, O.—The Public Utilities Commission has given its decision in the Bucyrus Light & Power Co. case, which has been pending for months, and in which complaint was made by the company that the city had passed an ordinance fixing the rate that the company should charge which was confiscatory. The commission fixes the valuation of the company's property, and its finding is more favorable to the city than to the company. The commission puts the valuation at \$95,000, and orders that the rate be based on this. Public utilities throughout the state have been watching the case.

Vote for Municipal Hydro-Electric Bonds.

Los Angeles, Cal.—Friends of municipal ownership are congratulating the city of Los Angeles for having voted \$6,500,000 bonds for completing the hydro-electric power plant of the Los Angeles Aqueduct and the building or acquisition of a distributing system to supply the city with light and power. The vote polled was the largest ever called out by a bond issue. It was 56,199 for and 23,179 against. The next step will be the condemnation and acquisition of one of the private company's distributing plants. The source of power is the great aqueduct that carries pure water 200 miles to the city. In the course of its descent the water from the Sierras carries a potential of 100,000 horsepower in electrical energy.

Opposes Long Gas Contract.

Boston, Mass.—If any contract is made with the Boston Consolidated Gas Co. or the Edison company it will not be for a 10-year period, according to the feeling of the City Council at present. The conference at city hall, participated in by the council, Commissioner Rourke and Vice-President Edgar N. Wrightington of the gas company, served as another indication that the Curley plan will fail. There is little hope of the gas company officials cutting their price, as announced at the recent hearing, in case a five-year contract is made. It will be \$1.50 more a lamp per year than by the long-term contract. The gas company's proposal, as was the case a year ago, has been divided into two contracts—one for supplying gas at the rate of \$9 per year, and second, a contract for operating the lamps at \$12 per year, making a total price per lamp per year \$21. In the case of the first contract, the price of gas is 60 cents per lamp a year lower than the price in 1913. The price of gas under the present contract is based on a yearly consumption of 12,000 cubic feet per lamp, at 80 cents per thousand cubic feet, making the cost per lamp per year \$9.36. According to Guy C. Emerson, who made an investigation for the Finance Commission, the city

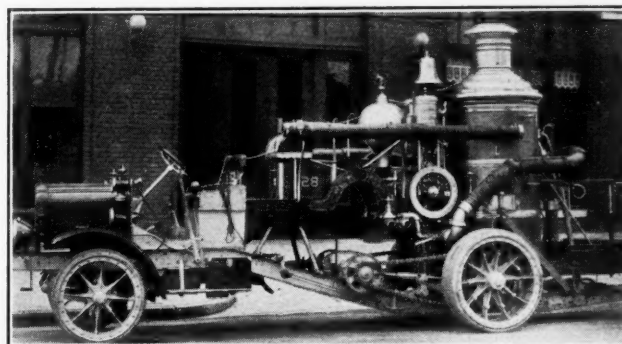
lamps probably burn about 14,000 cubic feet per lamp per year, making the actual rate to be paid for gas approximately 64 cents per thousand cubic feet. The second contract for furnishing street lighting equipment and operation at \$12 per lamp per year is an increase of 10 cents over last year's bid.

Alameda, Cal., Plant Profitable.

Alameda, Cal.—The electricity commission has submitted to the City Council its estimate for the ensuing year. The council does not have to raise money by taxation for the municipal plant, as it is self-supporting and pays a profit to the city besides having a balance on hand. It is estimated that receipts for the ensuing year will amount to \$176,300, which includes \$25,000 for city lighting. The estimated expenses for the coming fiscal year are \$112,431.25.

Company Sues County.

Trenton, N. J.—The Monmouth Lighting Co. of Freehold has brought a suit in the Court of Chancery against the Board of Freeholders of Monmouth county to compel it to remove a building which it is claimed is damaging the property of the complainant in Englishtown. The property involved is the site of the power house of the lighting company, and it is charged in the bill of complaint that the freeholders have a building on the land which is improperly constructed and maintained, so that the waters of Wemrock Brook are diverted and caused to flow so as to undermine the foundation of the power house. It is alleged that the walls and floors of the power house had been cracked and parts of the structure washed away. The plaintiff asks that the defendant be restrained from further damaging its property, and that the building be removed.



Courtesy Baltimore (Md.) News.

BALTIMORE'S NEW FIRE ENGINE.

Test New Triplane Lamps.

Marblehead, Mass.—The new triplane high-efficiency lamps are being tried out by the electric light department in the outlying districts of the town. The lights belong to the General Electric Co. and they have permission from the Marblehead light commissioners to use the town's wires. They pay for the use of the wires by lighting the several districts. The lamps are for experimental purposes and they will be on all summer.

MOTOR VEHICLES

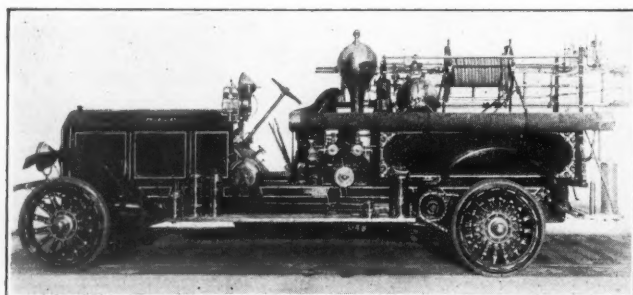
Rapid Motorizing of Baltimore Fire Department.

Baltimore, Md.—Baltimore City Fire Department is fast modernizing its fire-fighting equipment by the addition from time to time of new fire apparatus. With the delivery shortly of a few additional trucks Baltimore city will have in its use 19 White trucks and pleasure cars. This week will be delivered a new fire engine mounted on a White five-ton chassis and with the arrival in the near future delivery of two two-hose wagons the Fire Department of the city alone will have 12 Whites in use. At present five of the district chiefs are using White runabouts; there are two three-ton White hose wagons in the Fire Department, with orders placed for two more; there is also a White ambulance and a White supply wagon used by the Fire Department. The Electrical Commission is using two White trucks now—one of a three-ton capacity and one of

1½-ton capacity; a five-ton White with a special power dump body is in use by the City Engineer's Department, while the Water Department is operating a three-ton truck. The city jail van is a White, while the Police Department is also using one of this make.

Combination Makes Fine Showing.

Gloucester, N. J.—The first official test of the new auto combination chemical and pumping engine has been made, under the direction of Frederick Kauffman, an engineering expert who represented Gloucester City, and representatives of the American La France Fire Engine Company, the manufacturer. It was witnessed by the members of City Council, the Board of Fire Commissioners and the officials of the Fire Department, including Mayor and Fire Chief Mealey, as well as several hundred citizens. Water was pumped from the Delaware river. The specifications require a pressure of seven hundred gallons per minute, but with three streams in operation running fifteen minutes straight the test averaged eight hundred gallons per minute, and even ran up to eight hundred and fifty gallons on the triple line.



HARTFORD'S NEW PUMP.

New Aerial for Grand Rapids.

Grand Rapids, Mich. — The new Seagrave aerial fire truck, purchased by the board of police and fire commissioners, will be delivered very shortly. The new truck will be placed at No. 1 engine house. As soon as it arrives the changes in the location of apparatus will be made by Fire Marshal Lemoin.

Hartford, Conn., Tests New Pump.

Hartford, Conn.—Many fire department officials from cities throughout the state and as far away as Paterson, N. J., were in Hartford to see this city's new automobile fire engine, claimed to be the largest in New England, tried out. The tests were made at the river front at the foot of State street and lasted about two hours. The crowd was a large one and many of the city officials, in addition to the fire commissioners, were on hand to see the big machine work. The engine was made by the American La France Fire Engine Company. The motor apparatus comprises a pump, hose wagon and chemical engine and carries ladders sufficient to reach a third story window. The power is from a six-cylinder gasoline engine of 122 horsepower, but said to be able to develop 200 horsepower. The pump is under the driver's seat and has connections for four lines of hose. The guaranteed capacity is 1,400 gallons a minute, against a pump pressure of 120 pounds, or 700 gallons against 200 pounds. Working from a hydrant it can do even better. During the tests several combinations of hose nozzles and lines were tried. The first test was for pressure with 1,000 feet of 2½-inch hose, with 1¼-inch nozzle. A good stream was produced with a pressure of 325 pounds at the engine and 67 pounds at the nozzle, and giving a flow of 375 gallons a minute. In the second payout with three short lines of hose and 1¼-inch nozzles were used, the pump pressure was 140 pounds, the nozzle pressure 75 pounds, the total flow was 1,200 gallons a minute. To these three streams a fourth was added. The pump pressure was 120 pounds, nozzle pressure 65 pounds and the flow about 1,500 gallons, or 100 gallons above the guarantee. The three original streams were not materially affected by the fourth. For the next test the 2½-inch hose was disconnected and two lines of three-inch hose, 100 feet in length with 1½-inch nozzles were laid. This test produced a

pump pressure of 140 pounds, nozzle, 85 pounds, and the flow was about 1,230 gallons a minute. Four three-inch lines, 100 feet long, were then united into a deluge stream with a single 1½-inch nozzle. The pump pressure was 230 pounds, and the nozzle pressure over 200 pounds. A 1¾-inch nozzle was tried and the pump pressure was 180 pounds with a nozzle pressure of 170 pounds. The flow was about 1,200 gallons a minute. With a two-inch nozzle the engine pressure was 140 pounds, and the flow about 1,300 gallons. The final test utilized a 2¼-inch nozzle, which is larger than is ever used here in fires. The pump pressure was 125 pounds and the nozzle pressure as high as 105 pounds. The flow was 1,500 gallons a minute some of the time and over 1,470 right along. The tests were considered most favorable and the apparatus will be accepted and put into commission at an early date.

GOVERNMENT AND FINANCE

Commission Rule for Orange, N. J.

Orange, N. J.—In a contest unprecedented by the number of candidates, Orange inaugurated the commission form of government by electing five candidates out of a field of 33. City Clerk Daniel F. Minahan was given the most number of votes. The others are Mayor Frank J. Murray, Tax Assessor William J. Kearney, former Councilman William A. Calhoun and Tax Assessor Harry A. Wetzling. The election officers were kept pretty busy, and while many of the citizens were confused by the new preferential ballot, the insistent appeals of several candidates to vote only the five first choice list caused many voters to prepare their slips in that manner.

Cleveland's \$400,000 Bond Issue.

Cleveland, O.—In anticipation of the general revenue fund for the current fiscal year, Cleveland is issuing \$400,000 worth of 5½ per cent. certificates, for which bids will be received on June 1. The revenues from general taxation the last half of this year will approximate \$1,500,000, and from liquor license fees \$500,000. No additional issue will be made this current fiscal year.

Municipal Insurance Fund.

Berkeley, Cal.—The city, by municipal ordinance, has created an insurance fund for city employees who sustain disabilities in the course of their duties. A tax of one-half cent upon each \$100 of assessed valuation will be levied until the fund totals \$10,000.

To Make Attleboro a City.

Boston, Mass.—The legislative committee on cities has reported a bill to incorporate the city of Attleboro. The bill is unlike any other city charter in operation in Massachusetts at the present time. Its nearest approach is a charter recently granted to the city of Westfield. If this bill is enacted into law—and the present indications are that the bill will be enacted—Attleboro will be the 35th city of the state. It is interesting to note that the abbreviated form of the name of the town is stricken out and the name of the city will be Attleborough.

STREET CLEANING AND REFUSE DISPOSAL

Garbage Utilization in Schenectady.

Schenectady, N. Y.—The garbage disposal plant is rapidly nearing completion. Workmen are now engaged in placing machinery in the buildings, and it is confidently expected that things will be in running order by the middle of next month. The buildings of the plant are all of brick and are fireproof. It is planned at first not to take care of cans and bottles in the plant. The boilers will burn from five to eight tons of coal a day and furnish power to run the machines, as well as the steam for "cooking" the garbage in the digestors. The six digestors have a capacity of about eight tons each, making a total capacity for the plant of 50 tons a day. The present average collection of garbage in the city is about 30 tons a day. The greases and oils produced from the garbage reduction will be conveyed by pipe line to storage tanks outside the building, to

be drawn off to the tank cars on the railroad branch as required. The oils and greases will be sold for the manufacture of soaps, and the solid residue for fertilizer of a high grade. Deputy Commissioner W. W. Chadsey of the Public Works Department already has additional plans to take care of the cans, bottles and paper, which will be sorted from the garbage when it enters the plant in its raw state. All of these are a source of revenue if properly handled.

Costs of Garbage Collection.

Reading, Pa.—It has cost the city \$3.31 a ton for the collection and disposal of garbage since the old contract expired; the price under the latter was \$1.94 a ton. Dr. Seltzer, who formerly held the contract, agreed to continue to do the work for six months for \$3.50 a ton, but council turned down his proposition, believing this sum to be excessive. In figuring out the cost to the city the construction of a new road at the garbage plant at Millmont, digging of trenches to bury the garbage and other incidental expenses were considered. The price for the nine garbage wagons is not included. This would bring the figure considerably higher.

RAPID TRANSIT

Trackless Trolley for Miami.

Miami, Fla.—The first trackless trolley belonging to the Chase & Hardee system has arrived and been tested, to the satisfaction of its owners and the people. The car in every way resembles a regular street car and has a seating capacity of 32 and standing room for nearly as many. It is thought by many that the transportation problem in and about the city has been solved. Messrs. Chase and Hardee will have six of these cars when their present order is completed. Three of the cars will arrive later. As soon as the three cars are here the regular schedules will be maintained into the suburban districts.

Three-Cent Fare for Gary.

Gary, Ind.—Gary is to have a 3-cent fare on all interurban railroads within the city limits beginning Aug. 1. This has just been agreed to after a two years' fight in which the city council sought to compel the Gary and Interurban railroad to observe the 3-cent fare in their franchise.

Double Tracking.

Sacramento, Cal.—Patrons of the Tenth street car line are commenting favorably on the action of City Commissioner E. M. Wilder in forcing the Pacific Gas & Electric Co. to double track Tenth street, in spite of the company's determination that the slow, single-track method of transportation was good enough for this city. Crews of workmen have been at work for several days and the roadbed for the entire double tracking is ready for the laying of the ties and rails. Most of the ties already have been put in place, and workmen now are engaged in putting down the rails and ballasting the tracks as fast as they are being bolted and spiked down. Commissioner Wilder prepared an ordinance to force action by the Pacific Gas & Electric. The ordinance was adopted, and the work now going forward was the result.

MISCELLANEOUS

City as Landlord.

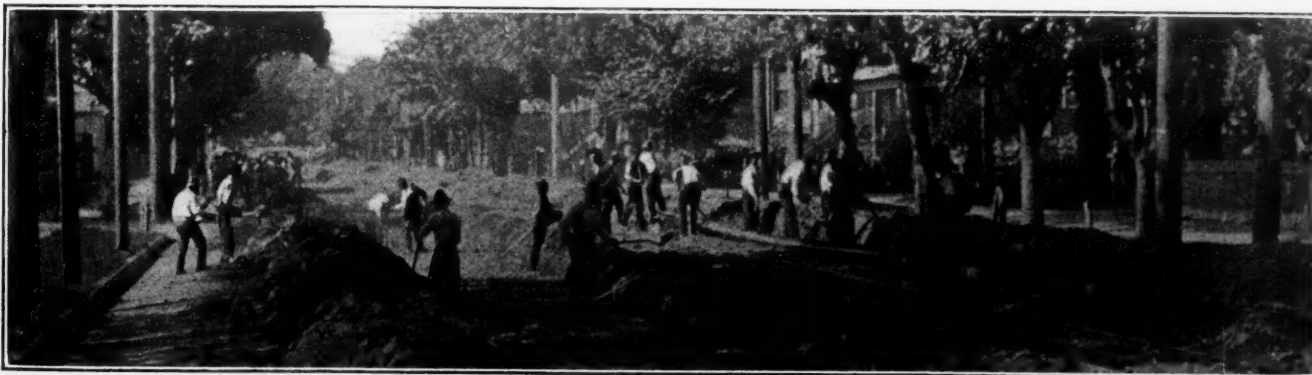
Superior, Wis.—With only 10 cents per acre rental collected, the city of Superior is landlord to a number of men, who will engage in dairying and market gardening. To make the deal the more attractive in the majority of instances the city has agreed if the terms of the lease are lived up to by the lessee, that he shall receive a stipulated sum per acre upon surrender of his rights. The city hopes through the generous terms offered to induce settlement upon a tract of nearly 1,000 acres which was secured under tax deed, particularly by men who will grow produce for the local market. It is hoped in actual returns to the city to receive no more than the taxes would amount to, with the additional gain of having the land cleared and put under cultivation. The land is all located near and inside the southern city limits west of the center. Under the terms of the leases the lessee agrees to clear not less than two acres each year and to cut out and clear a narrow road along the border of the land.

\$84,380 for Shade Trees.

Newark, N. J.—The budget for 1914 as adopted by the Shade Tree Commission shows an increase of about \$20,000. The total the commissioners will ask for is \$84,380, as against last year's expenditures, amounting to \$63,873.53.

Survey of All New York State Cities.

New York, N. Y.—The city planning experts of the New York State conference of mayors and other city officials have begun their work of making a city planning survey of all the cities in the state. For the last four months the experts have been preparing a questionnaire to aid officials to collect the necessary data in each city. This questionnaire, which, it is believed, is the first of its kind ever prepared in this country, has been mailed to the mayor of every city in the state. With it were sent detailed instructions about collecting the data called for. This data will be used as a basis for the general recommendations that the committee will make after the mass of facts has been tabulated and studied. The questionnaire, which contains 214 questions, calls for information about every phase of city planning. These include the organization of commissions, surveys, maps, legal restrictions, taxation and payments for improvements, city plans, streets, street traffic, paving, housing, trees, street signs, street accidents, parks and public recreation, transportation, public markets, water supply, sewage systems, garbage disposal, street cleaning, schools, gas and electricity, and the fire department. At the fifth annual conference, at Auburn, next month, the plans for the survey will be discussed by the city officials. Prof. James S. Pray of Harvard University will open the discussion. The conference's committee of city planning experts consists of Arnold W. Brunner of the New York Fifth Avenue Commission; Nelson P. Lewis, chief engineer of the New York City Board of Estimate and Apportionment; Edward Green, architect, of Buffalo; Daniel L. Turner, traction expert, with the Public Service Commission, First District, and Charles Downing Lay, former landscape architect, New York City.



Courtesy Sacramento (Cal.) Bee.

EXCAVATING FOR DOUBLE-TRACKING.

LEGAL NEWS

A Summary and Notes of Recent Decisions— Rulings of Interest to Municipalities

Inquiry Concerning Proposed Water Rates—Equity—Validity.

Turtle Creek Borough, Pa., et al. v. Penna. Water Co.—In a suit in equity to inquire into the reasonableness of a proposed increase of water rates, failure of the lower court to set out in its findings each separate item of value and to take the sum total of such items as the value of the water company's plans as the basis for ascertaining reasonable rates was not error, where such court stated in its opinion that all items had been considered in fixing the value. Water rates established by a court of equity are valid when they yield a fair return upon the just valuation of the plant, and are not confiscatory. Where, in an inquiry concerning a proposed increase in water rates, it appeared that the increase would yield a profit of 7.72 on the valuation of the water company's plant, the court properly established a rate sufficient to yield a profit of not less than 6 per cent.—Supreme Court of Pa., 1009 A. R., 194.

Explosives—Liability for Injuries—Proximate Cause.

Horam v. Town of Watertown, Mass.—Where the workmen of a town left dynamite in an improper and insecure box within the limits of a street, several sticks were taken therefrom at different times by young boys and thrown upon a fire, defendant's negligence in leaving dynamite in such box was not the proximate cause of an injury caused by an explosion of one of such sticks, as the town was not bound to anticipate a theft of the dynamite, and much less was it bound to anticipate a series of thefts, especially where the dynamite was taken in daylight, and there was nothing to indicate that anything of the kind had ever before been done; nor was it bound to anticipate that the boys, after taking the dynamite, would engage in the dangerous sport of throwing it on a fire.—Supreme Judicial Court of Mass., 104 N. E. R., 464.

Improvement District—Review—Assessments.

Viegle et al. v. City of Spokane, Wash.—Courts should not change the district established by commissioners after the assessment roll has been confirmed by the city council, except where the commissioners of the council have acted arbitrarily or fraudulently, or have proceeded upon a fundamentally wrong basis. Courts should not change the assessment upon property specially benefited after the assessment roll has been confirmed by the city council, except where the commissioners or the council have acted arbitrarily or fraudulently, or have proceeded upon a fundamentally wrong basis.—Supreme Court of Washington, 139 P. R., 33.

Street Improvements—Delay—Injury to Property Owners.

Williams et al. v. City of Seattle, Wash.—A city is not liable to a property owner for delay in the improvement of a street, impairing access to his property, the result of restraining orders issued pending suits to enjoin the work. Where a city instituted proceedings to improve certain streets, and was delayed by certain injunction suits, it was not liable to an owner of property which did not abut on the streets improved, but was located on a block between two of such streets, in that the delay caused damage to plaintiff's access to his property; the city being authorized, in the exercise of discretion, to improve streets without, at the same time, improving the connecting cross streets. Supreme Court of Washington, 139 P. R., 45.

Waterworks—Liability of City for Negligence—Presumption of Negligence.

Wigal v. City of Parkersburg, W. Va.—A municipality maintaining a waterworks system for supplying its inhabitants with water for domestic use is not thereby performing a governmental function, and is liable for acts of negligence respecting such business just as a private individual. A city is liable for injury caused by the breaking of its tank or reservoir in which it has collected water in large quantity to supply its waterworks system. In the ab-

sence of proof that the breaking of the tank was caused by superior force, such as an unusual and violent disturbance of the elements or an explosion clandestinely caused, negligence will be inferred from the breaking.—Supreme Court of Appeals, West Virginia, 81 S. E. R. 554.

Sidewalks—Public Character—Recognition.

Post v. City of Clarksburg, W. Va.—For the purposes of an action against a city for an injury alleged to have resulted from a defect in a sidewalk constructed along the side of a building and bordering on a public street, but on land belonging to the owner of the building, the sidewalk is sufficiently recognized as a public walk by the grant, by the city council, of a permit to the owners of the building to construct, maintain, and operate in such sidewalk an elevator in connection with their use of the building.—Supreme Court of Appeals of West Virginia, 81 S. E. R. 562.

Contracts—Validity—Oral Contract.

Jungdorf v. Town of Little Rice, Wis.—Where the parties entered into an oral contract complete in its terms, the fact that they contemplated the execution of a written contract and the giving of a bond for performance by plaintiff, which was never done, will not necessarily prevent the oral contract which was partly performed from taking effect.—Supreme Court of Wisconsin, 145 N. W. R. 1092.

Sidewalks—Defects—Injury—Duty.

City of Covington, Ky. vs. Visse.—Whether an obstruction maintained by a municipality on a sidewalk which was an inch and a half above the surface rendered the walk unsafe is a question for the jury, for reasonable men might well differ on that matter. A municipality is bound to use ordinary care to keep its sidewalks reasonably safe, and this duty is not affected by the number of its sidewalks or the number of water meter boxes which it maintains; and in an action by one who fell over a water meter box projecting above the sidewalk, evidence of the number of such boxes in the city is inadmissible. In an action for injuries sustained by plaintiff, who stumbled over a water meter box, which projected about an inch and a half above the surface of the sidewalk, evidence that other persons had stumbled over such box is admissible.—Court of Appeals of Ky., 164 S. W. R. 332.

Damages From Surface Water—Liability—Drainage.

Naysmith et al. v. City of Auburn, Neb.—A municipal corporation has the right to improve and provide for the drainage of its streets; but, if in so doing it causes an increased flow of surface water upon or against private property, and negligently fails to provide a sufficient outlet for the escape of the water thus brought upon or against such property, it will be liable to the owner thereof for any damage that may result from such negligence. Where it is alleged, and evidence is introduced tending to prove, a negligent or unskillful drainage of the streets by and within a municipal corporation, resulting in an overflow and damage to the property of the plaintiff, and the jury hearing the case had, by order of the court, inspected the property and the character of the alleged defective drainage of the accumulated surface water, the finding of the jury will not be disturbed unless shown to be clearly wrong.—Supreme Court of Nebraska, 146 N. W. R. 970.

Street Improvements—Protests—Delays.

Price et al. v. City of McPherson, Kan., et al.—When the mayor and council of a city of the second class duly pass and publish a resolution that it is necessary to pave, macadamize and curb a certain street of the city and the resident owners of property liable to taxation therefor do not, within 20 days after the last publication thereof, protest against such improvement, then the city has power to cause such improvement to be made. A delay of nine months after publication does not deprive the city of jurisdiction to proceed with the improvement, even if a majority of the owners of property liable to taxation therefor shall, before the passage of an ordinance to proceed therewith, protest against such improvement.—Supreme Court of Kan., 139 P. R. 1162.

NEWS OF THE SOCIETIES

Calendar of Meetings.

June 1-3.
NATIONAL CONFERENCE ON CITY PLANNING.—Annual Meeting, Toronto, Canada. Flavel Shurtleff, Secretary, 19 Congress street, Boston, Mass.

June 1-5.
NATIONAL ELECTRIC LIGHT ASSOCIATION.—Thirty-seventh Convention, Bellevue-Stratford Hotel, Philadelphia, Pa. T. C. Martin, Secretary, 29 West 39th street, New York City.

June 1-5.
AMERICAN ORDER OF STEAM ENGINEERS.—Twenty-eighth Annual Convention, Armory, Baltimore, Md.

June 2-5.
WISCONSIN GAS ASSOCIATION.—Annual Convention, Milwaukee, Wis. Hotel Pfister.

June 3-5.
CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS OF THE STATE OF NEW YORK.—Fifth Annual Conference Auburn, N. Y. W. P. Capes, Secretary, 105 East 22d street, New York City.

June 15-17.
SOUTHWESTERN WATER WORKS ASSOCIATION.—Third Annual Convention, New Convention Hall, Tulsa, Okla. E. L. Fulkerson, Secretary-Treasurer, Waco, Texas.

June 23-25.
SOUTH CAROLINA STATE FIREMEN'S ASSOCIATION.—Tenth Annual Meeting and Tournament, Florence, Ala. R. S. Hovel, Secretary, Sumpter, S. C.

June 23-26.
SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION.—Annual Convention, Prof. H. H. Norris, Secretary, Ithaca, N. Y.

June 30-July 4.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Seventeenth Annual Meeting, Hotel Traymore, Atlantic City, N. J. Edgar Marburg, Secretary, University of Pennsylvania, Philadelphia, Pa.

July 3-4.
AMERICAN SOCIETY OF ENGINEERS, ARCHITECTS AND CONSTRUCTORS.—Midsummer Convention, Brighton Beach, N. Y. T. Hugh Boorman, Secretary, 35 W. 39th St., N. Y. City.

July 17 and 18.
TRI-STATE PACIFIC COAST GOOD ROADS ASSOCIATION.—Annual Convention, Medford, Ore. George E. Boos, Secretary, Medford.

Aug. 18, 19, 20.
FIREMEN'S ASSOCIATION OF THE STATE OF NEW YORK.—Geneva, N. Y.

Sept. 11-12.
STATE FIRE MARSHALLS' ASSOCIATION OF NORTH AMERICA.—Annual Convention, Asheville, N. C.

Oct. 19, 20, 21.
ELECTRIC VEHICLE ASSOCIATION.—Annual Convention, H. Jackson Marshall, Executive Secretary, 29 W. 39th St., New York City.

October 20-23.
INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS.—Annual Convention, New Orleans, La. James J. McFalls, Secretary, Roanoke, Va.

November 18-21.
NATIONAL MUNICIPAL LEAGUE.—Annual Convention, Baltimore, Md. Clinton Rogers Woodruff, Secretary, Philadelphia.

Dec. 14-17.
AMERICAN ROAD BUILDERS ASSOCIATION.—Annual Congress and Exposition, International Amphitheatre, Chicago, Ill. E. L. Powers, secretary, 150 Nassau Street, New York City.

Engineers' Club of Cincinnati.

The Engineers' Club of Cincinnati was addressed May 21st by Henry M. Waite, city manager of Dayton and formerly city engineer of Cincinnati, on "The City Manager Form of Municipal Government." Mr. Waite said, in substance:

The city governed by a commission and city manager is analogous to any of our large corporations. The people are the stockholders. The commissioners are the directors, and the city manager is their representative selected to conduct the business in the most efficient manner possible.

Since both the commission and the city manager are subject to recall after

six months in office, the people have every means to enforce their wishes fully.

No serious drawbacks in the Dayton charter have yet developed.

Elimination of politics from municipal affairs eliminates the need for civil service.

When appointments are made on a strictly merit basis, greater efficiency may be obtained without civil service than with it. Civil service is necessary in the Federal form of municipal government, in order to eliminate partisan appointments.

With the advent of the commission-city manager form of municipal government there has been opened up a new field for the engineer. His is an ideal training for solving most municipal problems. He is a trained economist and efficiency expert. Inquiries come daily to the Dayton commission and city manager from universities, colleges and technical schools, asking for information upon which to base plans for new courses in city management and municipal engineering.

Cincinnati, with its municipal university and its co-operative courses, has an ideal opportunity to offer courses for the study of municipal management to its students.

The next meeting of the Engineers' Club will be its annual "ladies' night," on Thursday, June 4th, at the auditorium of the University of Cincinnati, when an address, illustrated by motion pictures, on "Manufacture of Tubes" will be given by a representative of the National Tube Company.

Convention of City Managers.

After the completion of the new Memorial Hall, Springfield (Ohio) expects to be host to the city managers of thirteen American cities.

City Manager Ashburner, who has the distinction of being the first city manager, is bringing all his efforts to bear on drawing the convention to Springfield and feels that he will succeed.

Following is a list of the city managers who will attend should the convention be brought to Springfield: William F. Robertson, Sumter, S. C.; John Mitchel, Hickory, N. C.; R. W. Pipkin, Morganton, N. C.; Henry M. Waite, Dayton, O.; Charles E. Ashburner, Springfield, O.; F. J. Lasky, LaGrande, Ore.; Ossian A. Carr, Cadillac, Mich.; no man chosen, Manistoe, Mich.; William A. Farish, Felix, Ariz.; S. A. Siberts, Jr., Morris, Minn.; M. H. Hardin, Amarillo, Tex.; D. W. Pinkerton, Montrose, Colo.; Keyon Riddle, Abilene, Kan.; S. D. Holsinger, Staunton, Va.

National Electric Vehicle Association.

One of the noteworthy achievements in the electric industry during the past year has been the phenomenal growth and extension of activities of the Electric Vehicle Association. In about six months time, the membership has been increased over fifty per cent, and the

number of sections has increased from two to eight, with the likelihood of fifteen sections being established by the time of the Philadelphia convention, which will be held three days, October 19, 20 and 21.

The National Electric Light Association has been conspicuous in co-operating in the further development of electric vehicle usage, and at the first technical session of the National Electric Light Association convention in Philadelphia (June 1-15) Tuesday at 2.30 p. m., a paper on the electric vehicle will be presented by W. P. Kennedy, consulting engineer of New York, and Dr. C. P. Steinmetz, who believes that the electric vehicle is the car of the future, will present an address also on the subject of the electric vehicle.

The electric vehicle will receive a great deal of attention from the National Electric Light Association, the Jovian Order, the Society of Electrical Development, etc., during the coming year, and with the organization of electric vehicle interests effected through the Electric Vehicle Association, very great progress is expected in the immediate future.

Convention of New England Electric Vehicle Interests.

By far the most successful convention of the New England Electric Vehicle interests, conducted jointly by the Electric Motor Car Club of Boston, and the New England Section of the Electric Vehicle Association of America, was held Tuesday and Wednesday, May 19 and 20, in the Engineers' Club, Boston, Mass.

The papers presented were: "Co-operation," by W. H. Blood, Jr., former president of the Electric Vehicle Association; "Recognition of the Electric," by Hayden Eames of the Standard Electric Car Company; "The Electric Vehicle Association," by A. Jackson Marshall, executive secretary of the Electric Vehicle Association; "What Constitutes a Good Electric," by A. C. Fach of the Rauch & Lang Carriage Company; "Utility of the Electric Vehicle, Pleasure and Commercial," by A. J. Bartlett, Baker Motor Vehicle Company; "Baraging and Service," by J. C. Bartlett of the Bartlett Garage, Philadelphia; "The Relative Fields of Gasoline, Electric, and Horse Trucks," by H. F. Thomson, Massachusetts Institute of Technology; "Touring by Electric Automobiles," by J. S. Codman, S. R. Bailey & Co., Boston; "Competition, Fair and Unfair," by Vere Shaw of the Peerless Motor Car Company; and "Weak Links in Electric Truck Salesmanship," by F. Nelson Carle of the General Vehicle Company.

An open business forum was conducted by Converse D. Marsh, of New York. On Tuesday afternoon a visit was made to the very large and complete electric garage of the Edison Company at the Service Building, which afforded an opportunity of noting how the Edison fleet of some

eighty-five electric vehicles is cared for.

A beefsteak dinner was served later in the Edison Service Building, adjacent to the Electric Garage. On Wednesday afternoon electric vehicles conveyed all those attending the convention to Bass Point where a very interesting baseball game was played between the Edison Company employes and representatives of electric vehicle interests, the game being won by the former.

The papers were of exceptionally high order, and the animated discussion was productive of the exchange of very valuable ideas, and as a result of the convention, it is felt that the sale and use of electric vehicles in New England has received considerable impetus.

Additional information is obtainable from the executive secretary of the Electric Vehicle Association of America, 29 West 39th street, New York City.

Tri-State Pacific Coast Good Roads Association.

The association will hold what is expected to be one its largest attended conventions in Medford, Ore., on July 17 and 18. The states represented are Washington, California and Oregon.

Mr. Boos, the secretary, said recently that he has visited hundreds of towns in California and Washington and he is now making a tour of Oregon in the interests of the big meeting. He says that Governor Johnson, of California, has assured him personally that he will attend and it is probable that Governor West, of Oregon, and Governor Lister, of Washington, will be in attendance. Samuel Hill, "the father of good roads," and president of the Pacific Highway Association, together with other prominent good road authorities, are on the program. The program which has been tentatively outlined will include addresses on the following topics:

"Bond Issues for Road Construction by Counties."

"Laterals to and from the Highways."

"Consolidation of Road Associations of the Three States."

"The Importance of the Rural Road to the Markets."

"Dividing This Organization in Three Distinctive State Branches, with One Federation Head."

"Highway Accounting."

"Waterways Structures, Bridges and Culverts, Who to Maintain."

"Labor Problem in Road Construction."

"Road Administration."

"Maintenance of Lateral Roads to State Highways."

"Licensing Vehicles Other Than Automobiles."

"Legal Suggestions Respecting Road Contracts."

Other topics of interest will follow.

A program of entertaining the attending visitors is in the hands of the several committees of the Medford

Commercial Club, University Club and the municipality will assure a pleasant and interesting visit to all comers.

The present officers of the association are:

Dudley V. Saeltzer, Redding, California, president; E. S. Collins, Ostrander, Washington, vice-president; J. W. McCoy, Ashland, Oregon, vice-president; Dr. J. B. Bullitt, San Jose, California, vice-president; B. F. Lynip, Alturas, California, treasurer; George E. Boos, Medford, Oregon, secretary.

American Institute of Electrical Engineers.

The 296th meeting of the American Institute of Electrical Engineers will be held in Pittsfield, Mass., May 28th and 29th under the auspices of the Pittsfield section. The general subject for discussion is to be "Relative Advantages of Y and Delta Connections."

The A. I. E. E. headquarters for the meeting will be at the Maplewood Hotel, and the technical sessions will be held in the convention hall.

The following program has been arranged:

Thursday Morning, May 28th.

9 a. m.—Registration.

Afternoon session, 2 p. m.

Opening address.

"Experiences with Line Transformers," by D. W. Roper.

"Experience of the Pacific Gas and Electric Company, with the Grounded Material," by J. P. Jollyman, P. M. Downing and F. G. Baum.

Thursday Evening, 8 o'Clock.

The Berkshire County University Club will hold its annual dinner at the Maplewood Hotel. All members of the American Institute of Electrical Engineers are invited to attend. Tickets (\$2 per plate) should be obtained promptly upon arrival at institute headquarters. Mr. William Stanley will be one of the speakers at this dinner.

Friday Morning, May 29th, 9 o'Clock.

"Influence of Transformer Connections on Operation," by Louis F. Blume.

"A Study of Some Three-Phase System," by Charles Fortescue.

"Inherent Voltage Relations in Y and Delta Connections," by R. W. Sorensen and W. L. Newton.

Friday Afternoon.

The afternoon will be devoted to entertainment. Arrangements are being made for events in golf, boating, tennis, motoring and other sports, through the courtesy of the Pittsfield Country Club and Pittsfield Boat Club.

Evening Session, 8 o'Clock.

"Harmonic Voltages and Currents in Y and Delta-Connected Transformers," by T. S. Edenker.

"Relative Merits of Y and Delta Connections for Alternators," by Mr. Guide.

Written discussions by Guido Semenza of the Edison Company of Milan,

and by Ferdinand Koscherak of the Thomson-Houston Company of Paris, by Causius M. Davis and by Dr. C. P. Steinmetz of the General Electric Company.

Professor Dugald C. Jackson of the Massachusetts Institute of Technology will preside at the meetings in place of John J. Frank, chairman of the Pittsfield section, who finds he is unable to be in Pittsfield during the meeting.

The entire program will be summarized and discussed at the close of the meeting by Percy H. Thomas.

The local arrangements committee in charge of this meeting is composed of Paul R. Smith, chairman, M. O. Troy, H. W. Tobey, H. P. Ball, V. E. Goodwin and Neal Currie.

Indiana Good Roads Ass'n.

The Indiana Good Roads Association held its annual meeting at the Claypool Hotel in Indianapolis on May 9th and listened to addresses from several well known roads authorities, chose officers for the coming year and passed resolutions calling for state aid in highway building. All the old officers of the association were re-elected. They are: C. A. Kenyon, president; C. F. Coffin, treasurer, and C. C. Brown, secretary.

The new vice-presidents chosen are: C. W. Fairbanks, Robert Springsteen, Fred Purdy, L. Ert Slack and Carl G. Fisher, all of Indianapolis; E. H. Clifford, Terre Haute; S. B. Fleming, Ft. Wayne; Marcus Sulzer, Madison; W. K. Hatt, Lafayette; John C. Boss, Elkhart; Thomas Taggart, French Lick; James W. Lytle, Brazil; J. M. Studebaker, South Bend, and Joshua Strange, Marion.

Among the speakers on the program were Charles A. Bookwalter, W. V. Rooker, Mrs. Fred Hoke, Clarence A. Kenyon and Mrs. Eliza Brigham, of Indianapolis, and Professor W. K. Hatt, of Purdue University. Mayor Joseph E. Bell delivered the address of welcome to the delegates, telling them that he was vitally interested in the good roads movement as he thought it was a worthy cause. He said he hoped the Indiana Good Roads Association would prosper and be able to do the work which it had mapped out for itself.

Engineering Society of Northwestern Pennsylvania.

An interesting talk by Armin Schotte on "The History and Manufacture of Cement" featured the regular meeting of the Engineering Society of Northwestern Pennsylvania at the Country Club in Erie on May 13. A score of members attended and enjoyed an evening devoted largely to social pursuits.

There was a general discussion of the address of Mr. Schotte. It was decided to hold the next meeting in June, which will be in the nature of an outing. The society will probably make an excursion to the water works filtration plant.

(Continued on page 797.)

NEW APPLIANCES

THE STRICKLER RATCHET PIPE CUTTER.

Eliminates Reaming and Filing.

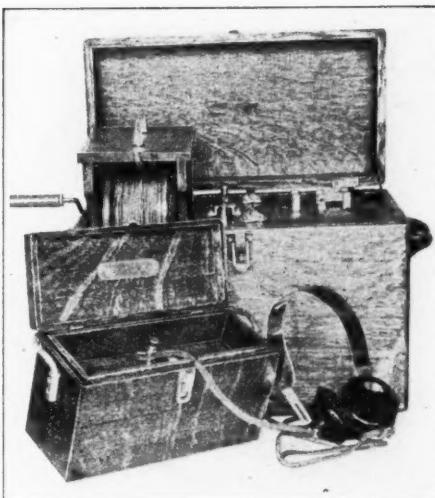
The Strickler Ratchet Pipe Cutter is designed to cut cast iron, steel and wrought iron pipe in any diameter between $\frac{3}{4}$ inch and 30 inches by hand. The cutting blades make a channel cut, leaving no burrs or ragged edges. The cutter opens wide and needs only a very small clearance. It is easily centered up and fastened by one swing bolt. The ratchet head, which holds the handle, is equipped with dogs engaging the teeth on the body of the machine. As the machine rotates the star feeder automatically feeds in the cutting tool. No. 2 and No. 3, shown in the illustration, are specially adapted for contractor's work, cutting $1\frac{1}{4}$ inches to 4 inches and $2\frac{1}{2}$ inches to 6 inches in diameter respectively. The former weighs 20 pounds and the other 40. No. 8, cutting 24 inch to 30 inch, weighs approximately 300 pounds. The cutters are made by W. N. Strickler & Bros., Columbus O.

CENTRIFUGAL TRENCH PUMP.

Special Accessibility Features—Patented Impeller Increases Lifting Power.

The New York Pump Company (5 Main street, Newark, N. J.—Eastern Agents: Anderson & White, 2 Wall street, N. Y.) are making a trench pump, one of their Dixon improved centrifugal pumps. In this pump the off-center suction is designed to eliminate side-thrust while the diffusion plate, cast with the casing, protects the interior from clogging. The inside mechanism can be removed without necessitating the removal of the suction or discharge lines. The bearing has a self-lubricating grease-cup. The patented impeller is constructed with Venturi system vanes in which the contraction of the waterways near

the middle of the vane is calculated to help the suction. The maximum capacity of No. 2 is stated as 125 gals. per minute when run with 1 h.p. gasoline



GROVE PIPE INDICATOR.

engine or electric drive. The pump starts with load. With a gasoline engine the total operating cost is claimed to be $2\frac{1}{2}$ cents per hour.

IMPROVED "BUFFALO" BOX.

Fitted with "No-Bolt" Cover.

The "Buffalo" extension service box with its cover and five-sided brass screw, which is sometimes a source of annoyance, has been improved. The Sanitary Company of America (Linfield, Pa.) is making a "Buffalo" box with a special "No-Bolt" repair cover. In the new box the lid fits flush instead of overlapping about $\frac{1}{2}$ inch. This is designed to eliminate freezing troubles and to insure ready access. The cover is locked by an invisible cam and can be opened by a few hammer taps—it is claimed that this cover cannot be knocked off.

GROVE ELECTRIC INDICATOR.

Locates Pipes Without Excavation.

In the increasing complexity of pipes and conduits buried under cities, old pipes which become lost sometimes necessitate much excavation in relocating. To save this the Grove Electric Indicator is designed to "find" and follow hidden pipes without excavation. The set consists of a transmitter and a recorder. The former is contained in a quartered oak carrying case $16 \times 8\frac{1}{2}$ inches and $11\frac{1}{2}$ inches high, the indicator is in a similar but smaller case. The transmitter consists of a storage battery and a special transforming coil with the necessary connections; another compartment of the box holds

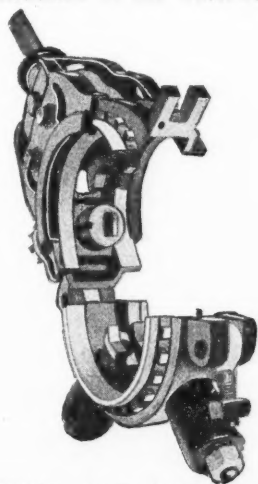
a reel with 500 feet of copper wire. The indicator consists of a super-sensitive current detector with two sensitive telephone receivers and head-band attached. The sounding of the instrument in every case indicates a pipe. The instrument may be used in locating junction points, indicating changes in direction and locating dead-ends besides ordinary "finding" uses. It is claimed that the character of the ground does not affect the efficiency of the instrument. It has been used in over 2,500 cases by the Water Department of the District of Columbia where it was first invented.

WATERPROOF JOINT COMPOUNDS.

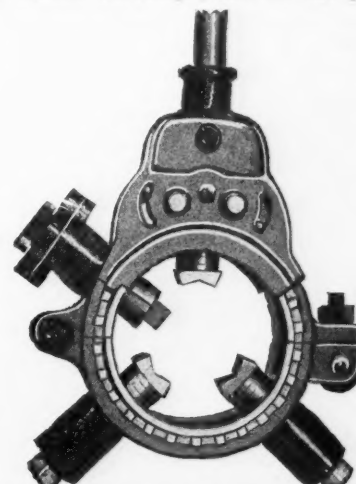
Five Jointite and Filtite Bitumen Compounds for Joining Sewer Pipes Under Various Conditions.

"Jointite" and "Filtite" compounds, manufactured for making water-tight joints in vitrified pipe sewers and meant as substitutes for cement, which is porous and rigid, are bitumen compounds claimed to be permanently adhesive, non-porous, flexible and waterproof. The compounds are claimed to have qualities which make them specially adapted to the work. The melting point is low enough to allow the material to stay fluid long enough to fill even the largest joint and to save fuel in melting, but high enough to make cooling as rapid as possible. The compounds for wet trench work are heavy enough to adhere firmly to wet pipe. Flexibility gives leeway for disturbances in alignment without the joint being cracked. The non-porous qualities prevent roots of shade trees growing into the joint which occurs often in cement joints.

"Jointite" is best adapted to wet trench work, is acid proof and weighs 105 lbs. per cu. ft. It is claimed that a "Jointite" joint will stand pressures up to the bursting point of the pipe.

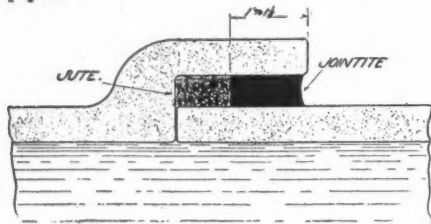


STRICKLER PIPE CUTTER NO. 3—OPEN.



STRICKLER CUTTER NO. 3.

"Filtite" is made in four grades—A and B weigh 85 and 92 lbs. per cu. ft. respectively. "Filtite C" is adapted for use in trenches where the water cannot be gotten below the pipe. "Filtite D" is lighter and is used for dry pipes.



USING JOINTITE.

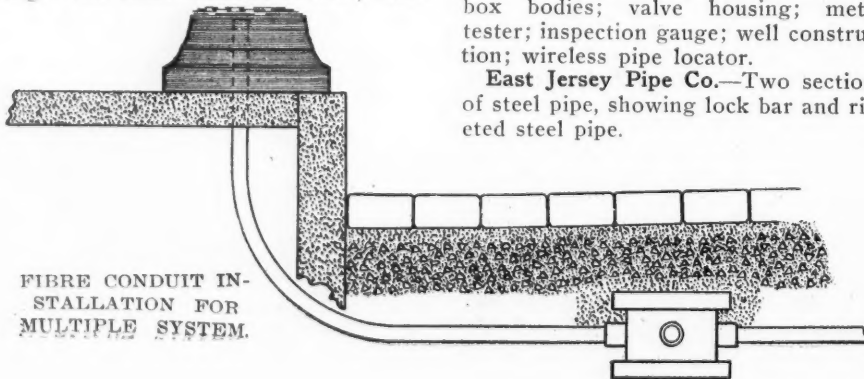
The general method of use, except with "C," is the same as that of pouring lead joints in c.i. pipe. The pipes are centered and lined with the bell and spigot together and jute calked tightly, leaving $1\frac{1}{2}$ inches for the material. A runner is clamped on the pipe and the joint poured full of heated material and allowed to cool. "Filtite C" is rolled into a sort of gasket and calked cold.

"Jointite" and "Filtite" are manufactured by the Pacific Flush Tank Co. (108 So. LaSalle street, Chicago, and Singer Building, New York).

FIBRE CONDUIT FOR LIGHTING SYSTEMS.

Orangeburg Fibre Conduit Used for Cable Systems for Street Lighting.

Orangeburg Fibre Conduit (Fibre Conduit Company, Orangeburg, N. Y.) is being used by a number of cities in the installation of ornamental street lighting systems. Among these are Dayton and Hamilton, O.; St. Joseph, Mo.; Springfield, Ill., and Fremont, Neb. The advantages claimed for Fibre Conduit in this work are light weight in handling, ease of installation and the facility with which cable may be drawn in and out—a very useful feature in the repairing of defective cable and the installation of new cable without digging up the street. It is claimed that the cost of installation is lower than that of an iron conduit of the same size. The fibre material is insulating, water-proof and non-hygroscopic and deterioration is prevented by impregnation with a bituminous compound. The joints are sealed with P. & B. compound No. 2 and are water-tight. The conduit is therefore claimed to be non-rusting, -corroding or -deteriorating. The smooth inside surface, with-



out offsets at the joints, will not injure the sheath of the cable. The conduit is made in socket joint and sleeve joint types, in five-foot lengths with a wall-thickness of $\frac{1}{4}$ inch, the inside diameter varying from $1\frac{1}{2}$ inches to 3 inches with approximate weights per foot running from 0.70 lb. to 1.30 lb. Junction boxes are made with either two, three or four outlets and in either type. Standard 45 deg. and 90 deg. bends and "S" bends are also made. The illustrations show a junction box and a type of installation in which Orangeburg Fibre Conduit has been used to advantage.

EXHIBITS AT THE WATER WORKS CONVENTION.

American Bitumastic Enamels Co.—

Pipe coated with Bitumastic enamel; photos of application of Bitumastic enamel at Panama lock gates, drydock Dewey, Mauretania (inside), etc.

American Cast Iron Pipe Co.—A 16-foot length of cast iron pipe, the only length of c. i. pipe this size made by any manufacturer.

Anchor Packing Co.—Ankonite patent pump valve; "Tauril" high pressure steam packing; Anchor Hydroil water packing.

Anderson & White (Agents for Iowa Valve Co.)—Cast iron valve extension box; Iowa patent fire hydrant; bronze mounted gate valves.

Badger Meter Mfg. Co.—Columbia meter box; fire hydrant section.

James Boyd & Bro.—Boyd turbine valve seats.

Birch Valve Mfg. Co.—Valve for water works pumping engine; valves for special purposes.

Cyrus Borgner Co.—Fire brick and clay retorts.

Builders Iron Foundry—Venturi meters and recording instruments; manometer for Venturi meters.

Buffalo Meter Co.—American and Niagara meter, using new type gear plate, which protects upper bearing of disc ball; portable testing meter; loose leaf meter reading book; meter account box.

Chapman Valve Mfg. Co.—Brass couplings "Anderson"; corporation cocks; gate valves; brass check valves.

Chicago Bridge & Iron Works—Elliptical bottom tank; photos.

H. W. Clark Co.—Meter box; the special Southern box; covers and lids; iron collapsible forms; "Teksagon" meter couplings; vitrified earthenware box bodies; valve housing; meter tester; inspection gauge; well construction; wireless pipe locator.

East Jersey Pipe Co.—Two sections of steel pipe, showing lock bar and riveted steel pipe.

Electro Bleaching Gas Co.—A plant in practical operation was a center of attraction.

Ford Meter Box Co.—Section of box in position.

Glauber Brass Mfg. Co.—Brass goods for water works, gas and plumbing generally. A live monkey in the booth attracted much attention.

Grove Electric Indicator Co.—Practical exhibit of instrument for locating underground mains.

Harrison Bros. & Co.—Showed crystal alum as manufactured; "iron-free sulphate of alumina," 22% Al_2O_3 ; rust inhibitive "Antoxide."

Hays Mfg. Co.—Tapping machines, Payne's patent, "New Eclipse"; sill-cocks; valves; hose boxes; hydrants; street washers; extension service boxes.

Hersey Mfg. Co.—Compound Torrent meter, new type.

The Leadite Co.—Line of pipe jointed with "Leadite" under 250 pounds' pressure per square inch; "Leadite" gasoline furnace for melting; photos



JUNCTION BOX AND SOCKET JOINT OF FIBRE CONDUIT.

of pipe lines under railroad tracks, showing resistance to vibration, etc.

Lead Lined Iron Pipe Co.—Sections of iron lead-lined pipe.

Leavitt-Jackson Engineering Co.—Simplex automatic chlorinator in operation.

Modern Iron Works—Eclipse meter box; wireless pipe locator; plumbing and steam specialties.

H. Mueller Mfg. Co.—Tapping machines; meter tester; pressure regulator; extension service box; corporation cocks, check valves.

Multiplex Mfg. Co.—"Crispin" air valves for water mains, separated into parts to show construction.

National Meter Co.—New compound meter, for large consumers, records small flows; complete exhibit of regular types.

National Water Main Cleaning Co.—Sections of pipes, showing incrustations of iron, clay, lead, dirt and carbonate of lime removed from water pipes at various cities.

Neptune Meter Co.—Trident meter section; water-cart meter for sprinklers or flushers; compound meters.

N. Y. Continental Jewell Filtration Co.—Standard filter operating table and miniature pressure filters, loss of head gauge and effluent controllers.

Pennsylvania Salt Mfg. Co.—Sulphate of alumina; hypochlorite of lime; liquid chlorine; iron-free hypo.

The Permutit Co.—Literature of water softening and deferrizing material.

Pitometer Co.—New "Cole" recorder measures water of exceedingly low velocities; metal diaphragm connected to outside mechanism by magnets, eliminating friction to maximum extent.

Pittsburgh-Des Moines Steel Co.—Water towers and standpipes.

Pittsburgh Filter Mfg. Co.—Loss of head gauge, wash water gauge and filtered water sample pump, for hand-operated filter plant; operating table; recording loss of head gauge and filtered water pump mounted on table; model of rapid sand filter, including sedimentation and coagulating basin.

Pittsburgh Meter Co.—Keystone, Comportector; fire line meter, a large and small meter in one casing.

Pitts & Kitts Mfg. & Supply Co.—Fisher governors; Kitts O. K. steam trap; Everlasting blow-off valves; Perolin—German liquid metal treatment

for removing scale, mechanical, and not a boiler compound.

Rensselaer Valve Co.—Water valves and fire hydrants.

Ross Valve Mfg. Co.—Ross pressure regulating valve; fire hydrant valves, etc.

Sanitary Co. of America—Extension service box with "No Bolt" cover—identical with old "Buffalo" box, except that lid fits flush.

S. E. T. Valve & Hydrant Co.—Exhibit of valves, curb box and gate box.

Simplex Valve & Meter Co.—Air valve; air and vacuum poppet valve; gauges; single leg manometer; elevation gauges; Simplex filter rate controller; Simplex registers; portable Pitot chart recorder; altitude valves.

A. P. Smith Mfg. Co.—Meter testing machine; tapping machines; bolted sleeve and valve; repair sleeve, damper sleeve and valve.

Standard Asphalt & Rubber Co.—

Mineral rubber pipe coating; pipe coated.

Thomson Meter Co.—Glass meter in operation (upper part of meter is made of glass); meter on exhibit recording on 1/64-inch orifice, 50 pounds pressure.

Union Water Meter Co.—"Nilo," King, Union, Rotary and King vertical type in upright pipe.

United Lead Co.—Lead wool.

Water Works Equipment Co.—Detectorphone.

Thomas Watkins—Watkins pipe jointer.

Henry R. Worthington.—Model D (disc type), Model G (disc), Model F (frost-proof) turbine meter (current type); new frost-proof made up with clamps, and in case of frost individual clamps break, thereby prevents damage; clamps easily replaced, without much expense.

R. D. Woods & Co.—Separate room; free use of stenographer, typewriter and telephone. Matthews fire hydrants and indication posts and gate valves.

INDUSTRIAL NEWS

Cast Iron Pipe.—Chicago Quotations—4 inch, \$26; 6 to 12 inch, \$24; 16 inch and up, \$23.50. Birmingham Quotations—4 inch, \$20.50; 6 inch and upward, \$18.50. New York—Competition is keen and demand is increasing. Quotations—6 inch carloads, \$20.50 to \$21.

Lead.—Quotations. New York—\$3.90; St. Louis, \$3.80.

Decline in Block Tire Prices.—The Goodyear Tire & Rubber Company has just announced a reduction of approximately five per cent in the price of Goodyear Individual Block Motor Truck Tires. According to advice received from the factory at Akron, this was made possible by the constantly increasing demand for this type of tire by motor truck operators. Raising the production volume lowered the cost to an extent sufficient to warrant a five per cent decrease in selling price which puts the block tire on the same basis as the endless tire. In other words, a truck owner can now buy a block tire at the same price as he would have to pay for a demountable or pressed-on tire.

New Concrete Mixer Co.—Irving S. Orr, J. Joseph Shaughnessy, C. Raymond Weaver and Abbott Phillips have incorporated under the name of the Automatic Concrete Company, Inc. The concern is capitalized for \$50,000, and is authorized to manufacture and sell concrete mixers and other machinery. It will be located in Providence, R. I.

American Gas Machine Co.—The announcement of the opening of the New York export office was made in these columns a few weeks ago. The address is: American Gas Machine Co., 86 Warren Street, New York City.

Progress of Asphalt Industry.—Aside from the figures that tell the story of financial operations, the annual report of the General Asphalt Company for the year ending April 30th contains some matters of general interest to municipalities and the paving and road building industry in general. As showing the policy of the company to encourage the widest distribution of its products through other contractors than its own operating organization, the Barber Asphalt Paving Company, paving operations slightly decreased, while the sales of asphalt so far increased that the total volume of business done in the past year is nearly \$300,000 in excess of that of the year previous. The entire tonnage of Trinidad and Bermudez asphalts sold and consumed was 321,222 tons, as compared with 300,403 tons in 1912.

Under the heading of Maintenance of Pavements, the report shows that in 1905 the average length of guaranty was 7.2 years and the percentage of pavements laid without guaranty 6.4. In 1913 the average length of guaranty was 2.45 years and percentage of pavements laid without guaranty 51.6, all of which means that municipalities have seen the wisdom of getting cheaper pavements by assuming their own guaranty, and have found this to be the best and most economical policy.

On the subject of Road Building the report after showing an increase of about 2,000 tons in the sales of Bermudez road asphalt, remarks: "The fact that some asphaltic highways have been poorly built with inferior materials cannot have more than a passing and localized effect upon the adoption of this form of construction for country highways. This opinion is confidently held for the reason that the roads built in 1909 under skilled

supervision with your company's material by experienced contractors are giving excellent service, and are requiring very little expenditure for maintenance."

The balance sheet of the company shows an increase in volume of business of from \$14,995,323 in 1912 to \$15,279,351 in 1913. The net gain to surplus was \$1,152,667 as compared with \$1,120,924 in 1912.

NEWS OF SOCIETIES.

(Continued from page 794.)

American Association for Promoting Hygiene and Public Baths.

The annual convention of the association took place at Newark, N. J., on May 12, 13 and 14. All the sessions were open to the public and many interesting papers were read.

Among those who presented papers at the first session were: Dr. Thomas Darlington, health officer of New York, who spoke on hygienic provision for industrial enterprises; Surgeon E. K. Sprague, of the United States Public Health Service, who discussed the relation of insects and vermin to diseases; E. Porter, State Entomologist of New York, who talked about controlling the fly.

Ernst Hermann, superintendent of the Playground Commission of Newton, Mass., told the convention of a system of class baths in that city which has been successful. Dr. Richard, of Newton, president of the State Board of Health, discussed a paper read by Professor A. N. Buswell, instructor in sanitary analysis at Columbia University, on chlorination of swimming pools at the Tuesday afternoon session. Commodore Charles Raynor of the United States Volunteer Life-Saving Service, and James K. Alvinson, instructor in the Newark play-grounds, spoke on life-saving.

After discussing extensively the im-

portance and effective control of swimming pools, the delegates chose these officers: President, Dr. Baruch, of New York; first vice-president, Rev. Dr. Thomas Beadenkoff, of Baltimore; second vice-president, Hugh C. McGrath, of Boston; treasurer, August V. Windolph, of New York; corresponding secretary, Mrs. J. Wells Wentworth, of New York; directors, Dr. Baruch, Dr. Beadenkoff, Dr. Joseph E. Gichner, Dr. Hale, Mrs. Jacobson, Mr. Mason, Mr. McGrath, W. L. Ross and Mr. Windolph.

State Firemen's Association of North Carolina.

The program for the State Firemen's Association meeting which will be held in Winston, Salem, August 4 to 8, has been completed. The business sessions will be held August 4, and the three days following will be given over to the tournament contests and many other attractions to be provided for the entertainment of the visitors. Mayor O. B. Eaton will deliver the address of welcome.

The race committee has arranged the following as the program for the efficiency contests in handling the apparatus of the various companies who will bring their equipment here for the tournament:

August 5: 9:30 a. m., firemen's parade; 2 p. m., State horse hose wagon contest; 4:30 p. m., league baseball.

August 6: 10 a. m., State hand-reel contest; 11 a. m., State grab-reel contest; 4:30 p. m., baseball.

August 7: 9:30 a. m., interstate hand-reel contest; 11 a. m., interstate grab-reel contest; 2 p. m., interstate horse hose wagon contest; 4:30 p. m., baseball.

The finance committee has announced many valuable prizes.

Carolina Municipal Association.

At Charlotte, N. C., on May 14th and 15th, the Carolina Municipal Association held its annual convention with representatives from many municipalities attending in large numbers. The city was well decorated with flags and bunting and gave a splendid welcome to the delegates. From many towns and cities photographs were sent to Charlotte and hung in the city hall and council chamber.

The following program obtained:

On Thursday, May 14th.

10 a. m.—Municipal parade of visiting and local city officials and all the departments of the City of Charlotte.

11:30 a. m.—Convention called to order by Hon. Charles A. Bland, mayor of Charlotte, president of the association. Prayer by Rev. A. A. McGeachy, D. D. Address of welcome in behalf of the City of Charlotte by Gen. T. L. Kirkpatrick, mayor pro tem of Charlotte. A few words of welcome by Mr. Charles C. Hook, president of the Greater Charlotte Club. Response by Hon. Fred L. Sutton, mayor of Kinston. Adjournment.

2:30 p. m.—Address, "City Government," by Hon. T. J. Murphy, mayor of Greensboro. Paper, "Municipal Sanitation," by Hon. Paul Jones, mayor of Tarboro.

8:30 p. m.—Paper, "Extermination of the Fly," by Mr. E. P. Wharton of Greensboro. Talk on "City Government of Baltimore and Its Development," by Robert E. Lee, mayor's secretary, Baltimore.

9 p. m.—Paper, "Street Paving," by Hon. P. Q. Moore, mayor of Wilmington. Paper, "Fire Insurance," by Mr. Alexander J. Field, Raleigh.

On Friday, May 15th.

10 a. m.—Paper, "Benefit of Inspection of Fire Department Both to the City and Departments," by Mr. Sherwood Brockwell, chief of fire department, Raleigh. Paper, "Freight Rates," by Hon. Fred N. Tate, mayor of High Point.

"Civic Fitness," by J. L. Ludlow, C. E., M. S., Winston-Salem. Paper, "Health Department," by Hon. J. E. Rankin, mayor of Asheville. Paper, "City Playgrounds," by Hon. O. B. Eaton, mayor of Winston-Salem. Paper, "Sewers and Sewage Disposal Plants," by Mr. Samuel H. Lea, city engineer, Charlotte. Paper, "City Finances," by Hon. E. L. Mason, chairman of finance committee, Charlotte. Election of officers and selection of place for next annual meeting.

8 p. m.—Smoker and Dutch luncheon at Charlotte Auditorium.

The convention was brought to a close by the election of these officers:

President, Charles A. Bland, of Charlotte; first vice-president, T. J. Murphy, of Greensboro; second vice-president, P. Q. Moore, of Wilmington; third vice-president, O. B. Eaton, of Winston-Salem; fourth vice-president, James I. Johnson, of Raleigh; fifth vice-president, J. A. Wallons, Smithfield; sixth vice-president, A. F. Hartsell, Concord. O. P. Shell, of Dunn, who has served as secretary and treasurer for the past two terms, was reelected.

The 1915 convention will be held at Asheville, N. C.

International Modern City Exposition.

The International Modern City Exposition was opened May 12 at Lyons, France, by Raoul Peret, French Minister of Commerce. Among American cities exhibiting are New York, Philadelphia, Cleveland, Boston and Chicago.

Conference of Vermont Mayors.

A conference of mayors of Vermont cities to discuss commission form of government was held May 7 at Burlington. Rutland, Montpelier, Barre, St. Albans and Vergennes were represented, the cities being represented in most cases by the mayor and one or two aldermen. A tour of inspection was made of the city in automobiles on invitation of Mayor Burke.

Then came the meeting in the city hall over which Mr. Burke presided.

Prof. G. G. Groat, of the University of Vermont, led the discussion which was participated in informally by many present. The city officials were guests of the Merchants' Association at the weekly luncheon.

Those present included Mayor Boutwell and Aldermen Ryan, Standish, McKeene and Frenier, of Montpelier; Mayor J. E. Maun and Alderman A. A. Parmalee, of St. Albans, and the mayors of Rutland and Vergennes.

PERSONALS

Jamestown, N. Y.—At a meeting of the common council Mayor Carlson made some of the deferred appointments of city officials. Frank O. Anderson, John E. Roberts, Arthur Greenlund and Walter I. Blystone were named to the water and electric-lighting commission.

Other appointments made are: City treasurer, Oscar F. Price; city auditor, Earl O. Hultquist; member of hospital commission, Charles L. Eckman; members of board of health, August F. Nelson, the Rev. F. V. Hanson, J. E. Johnson; superintendent of streets, F. W. Swanson.

Essex Junction, Vt.—Frank E. Allen has been appointed superintendent of streets, and David Demag, chief of police.

Porchester, N. Y.—The trustees have announced their appointments: Corporation counsel, S. R. Wilcox; village clerk, R. L. Burns; superintendent of fire alarms, A. Bell; president board of health, Trustee S. H. Merblum.

Douglas, Ariz.—Council has selected C. B. Fleming as member of the city water commission.

Tacoma, Wash.—The following officials assumed office recently: Mayor, A. V. Fawcett; councilmen, C. D. Aitkens and J. C. Drake; purchasing agent, H. E. Knatvold; assistant superintendent of electrical works, E. M. Arquett.

Newton, Mass.—George E. Stuart has been chosen street commissioner by Mayor Childs.

Belle Fourche, S. D.—City commissioners recently chosen: Wm. Lefers and J. A. Kemfick.

Corunna, Mich.—Mayor N. J. Simeon has appointed the following: William Striggow, city engineer; A. J. Withington, superintendent water works; Dr. W. T. Parker, health officer, and W. E. Jacobs, president of council.

Hartford, Conn.—Mayor Lawler has made the following appointments: Police commissioners, J. A. Pilgard and C. E. Hubbard; fire commissioners, J. F. Holden and Thomas F. Garvan; street commissioners, E. J. McDonough and E. C. Halliday; health commissioners, Dr. H. N. Costello and E. M. Roszelle.

Lockport, N. Y.—Water superintendent recently appointed is F. S. White.

ADVANCE CONTRACT NEWS

ADVANCED INFORMATION BIDS ASKED FOR

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES
STREETS AND ROADS				
Ill.	Charleston	1 p.m., May 30	5,300 ft. waterbound macadam, 9 ft. wide	H. E. Shinn, Co. Supt. Hwys.
Minn.	Walker	2 p.m., May 30	Road work	Roy Devore, Town Clk.
La.	Belmont	May 30	Six miles highway	Bd. State Engrs., N. Orleans.
Va.	Ft. Meyer	June	Reconstructing heavy traffic roads	Quartermaster.
Mont.	Ft. Benton	June	Constructing about 21,780 sq. yds. waterbound or bituminous macadam, 23,305 ft. concrete sidewalk	City Clerk.
Ky.	Burlington	June	20 miles macadam road with bridges	City Clerk.
Kan.	Atchison	June	12,500 sq. yds. paving and 4,000 ft. combined curb and gutter	City Clerk.
O.	Cleveland Heights	June	Oiling a number of roads	H. H. Canfield, VII. Clk.
Fla.	Jacksonville	7.30 p.m., June	13,440 sq. yds. asphaltic concrete on concrete	Board Bond Trustees.
Sask.	Regina	noon, June	113,000 sq. yds. of pavement	City Commrs.
Wash.	Rockford	June	Macadamizing several streets	City Clerk.
Ind.	Vincennes	June	Concrete sidewalk	City Clerk.
Minn.	Detroit	8 p.m., June	200 ft. cement walk and 150 ft. cement crosswalk	E. J. Bestick, City Clk.
La.	Alexandria	7.30 p.m., June	Bitulithic and fibre vit. brick pavements	L. Weil, Sec.
O.	Canal Dover	about June	Constructing brick pavement	W. E. Sykes, Dir. P. S.
Ark.	Jonesboro	2 p.m., June	About 10,000 sq. yds. brick paving and 4,000 ft. concrete curbing	P. H. Berger, Sec. St. Imp. Com.
Mich.	Lansing	4 p.m., June	Furnishing 125,000 paving bricks	P. F. Gray, City Clk.
Ind.	Franklin	2 p.m., June	Grading and paving in townships	H. L. Knox, Co. Aud.
Ind.	Charlestown	10 a.m., June	Grading, draining and paving with macadam	G. W. Stoner, Co. Aud.
Ind.	Williamsport	2 p.m., June	Grading, curbing and paving	D. H. Moffitt, Co. Aud.
Ind.	Middletown	June	Constructing vit. brick pavement, concrete curb and gutter, cost \$53,000	Co. Bd. of Commrs.
Ind.	Vernon	10 a.m., June	Grading and paving in various townships	C. L. Airhardt, Co. Aud.
N. D.	Mohall	2 p.m., June	Gravelling grade	P. Carlson, Co. Aud.
Tex.	Mart	10 a.m., June	Paving with various materials, 17,400 sq. yds. pavement, and constructing 4,500 ft. combined curb and gutter	L. Robertson, City Eng.
Ill.	Cicero	8 p.m., June	Asphaltic concrete pavement on two streets	C. Jepsen, Pres. Bd. Loc. Imps.
Ind.	Winamac	June	4,609 sq. yds. brick paving	C. E. Paul, Engineer
Ind.	Greensburg	1 p.m., June	Constructing two roads in township, also one clay road	Decatur County Comrs.
Ind.	Jefferson	10 a.m., June	Constructing township road	G. W. Stoner, Auditor
Ind.	Newport	10 a.m., June	Gravel road	R. Slater, Co. Auditor
Ind.	Portland	10 a.m., June	Stone road	J. Bonifas, Auditor
Ind.	Vernon	11 a.m., June	Stone road in three townships	G. J. Burnhart, Co. Auditor
Ind.	Greencastle	2 p.m., June	Macadam and gravel roads in three townships	C. L. Airhardt, Co. Auditor
Ind.	Paoli	2 p.m., June	Constructing one road	E. A. Palmer, Auditor
Ind.	Versailles	1 p.m., June	Macadam roads in two townships	F. Lochard, Auditor
Ind.	Brookville	1 p.m., June	Macadam road	G. Reiffel, Auditor
Ind.	New Castle	10 a.m., June	Brick and concrete roads	P. H. Wolfard, Auditor
Pa.	Steelton	7.30 p.m., June	Subgrading, curbing and paving several streets	C. P. Feigt, Boro. Secy.
Conn.	New Britain	June	23,000 sq. yds. of semi-permanent pavement	E. H. Oldershaw, City Engr.
Ill.	Pana	2 p.m., June	About 29,000 sq. yds. vitrified brick and 34,300 ft. of curb	A. C. Stanfield, Engr.
Ind.	Anderson	10 a.m., June	Gravel road in four townships	J. B. Benefield, Auditor
Minn.	Two Harbors	8 p.m., June	About 5,000 bbls. Portland cement for street work	A. Omtvedt, City Clk.
Pa.	Williamsport	10 a.m., June	Paving with brick two roads	City Clerk.
Md.	Baltimore	Noon, June	Paving 17.83 miles in five counties	O. E. Weller, Chr. State Rds. Comm.
N. D.	Mohall	2 p.m., June	Constructing, surfacing and leveling various roads	P. Carlson, Co. Aud.
Minn.	Ortonville	10 a.m., June	Grading and turnpiking; cost, \$3,105	A. B. Randall, Co. Aud.
Minn.	Worthington	2 p.m., June	Grading, gravelling and turnpiking; cost, about \$3,500	G. Swanberg, Co. Aud.
N. D.	Linton	2 p.m., June	Constructing concrete walk	J. R. Snyder, Co. Aud.
Ohio	Steubenville	noon, June	Constructing protection wall	J. L. Means, Co. Auditor
N. J.	Belvidere	noon, June	Constructing four miles of waterbound macadam road	Board Chosen Freeholders.
Wash.	Port Angeles	10 a.m., June	Constructing 3.4 miles of road	Board County Comrs.
O.	Columbus	2 p.m., June	Constructing bridges and culverts, also grading and paving in a number of counties	J. R. Marker, St. Hwy. Engr.
Miss.	Aberdeen	June	\$50,000 street improvements and treating macadam road with bituminous binder	G. Hauser, Engr.
Ill.	Chicago	8 p.m., June	Improving road with 1,200 ft. sandstone curbing, 42,000 sq. yds. asphaltic concrete pavement, adjusting catch-basins, etc.	W. E. Hatterman, Pres. No. Shore Park Dist.
Ind.	Monticello	10 a.m., June	Grading, curbing and paving	A. G. Fisher, Co. Aud.
Ind.	Goshen	1 p.m., June	Grading, curbing and paving	J. W. Brown, Co. Aud.
O.	Bowling Green	1 p.m., June	Grading, draining, macadamizing and applying tar binder	C. E. Stinebaugh, Co. Aud.
Minn.	Marshall	2 p.m., June	500 ft. 12-inch corrugated iron culverts, 82 concrete culverts, and otherwise improving road; cost, \$51,668	E. S. Shepard, Aud.
Minn.	Two Harbors	10 a.m., June	Clearing, grubbing, grading, about 14 miles	J. P. Paulson, Aud.
D. C.	Washington	2 p.m., June	Repairs to asphalt pavement	District Comrs.
Ind.	Kokomo	10 a.m., June	Constructing stone, gravel, asphaltic conc. and brick rd.	E. B. Swift, Co. Aud.
Ind.	Delaware	10 a.m., June	Grading, graveling or macadamizing state highway	Delaware Co. Bd. Comrs.
Ill.	Chicago	11 a.m., June	Constructing concrete curb, grading and paving with vitrified brick, etc.	Board of Loc. Imps.
Pa.	Philadelphia	11 a.m., June	938 sq. yds. of waterbound Telford	Valley Ford Park Comrs.
Ohio	Cleveland	11 a.m., June	Improving road	Co. Commrs.
Minn.	Halstead	7 p.m., June	Cement walks, driveway crossings, comprising 17,000 sq. ft. sidewalks and about 40 crossings	A. O. Ueland, VII. Rec.
N. D.	Bismarck	2 p.m., June	Grading work	F. E. Flaherty, Aud.
Me.	Augusta	11 a.m., June	State highway in four towns, aggregating 11.45 miles	State Highway Commission.
La.	Sheldon	8 p.m., June	12,000 sq. yds. paving, either brick, asphaltic concrete, cement or Dolanway bitumen on concrete base	S. Martin, City Clk.
Minn.	Duluth	2 p.m., June	6 1/4 miles road construction and 6 1/2 miles of clearing, grubbing, etc.	O. Halden, Co. Aud.
Utah	Ogden City	10 a.m., June	Constructing sidewalk	F. O. Stanford, City Rec.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Tex., Belton	June 4	80 miles of road work	Co. Comrs.	
Ind., Logansport	10 a.m., June 4	Constructing road	C. E. Medland, County Aud.	
Ind., Ft. Wayne	10 a.m., June 4	Grading, draining and paving with concrete	C. H. Brown, Co. Aud.	
O., Cincinnati	Noon, June 5	Paving 1 street with brick	Dir. Pub. Service.	
Ind., Columbus	1 p.m., June 5	Macadam road on county line	F. J. Sater, Co. Auditor	
N. J., N. Plainfield	5 p.m., June 5	Macadamizing street	C. M. Dolliver, Clk.	
R. I., Newport	June 6	2,680 sq. yds. macadam, 2,735 lin. ft. concrete curb and gutter, 2,380 sq. ft. granolithic walk, etc.	Navy Dept., Wash., D. C.	
Minn., Plummer	2 p.m., June 6	Excavating for road construction	E. C. Havik, Town Clk.	
Minn., Spooner	June 8	Grubbing and grading 3 miles	A. Johnson, Town Clerk.	
O., Bremen	June 8	12,000 sq. yds. brick pavement	City Clerk.	
O., Lancaster	June 8	Paving with brick, curbing and draining	E. A. Hufford, City Clerk.	
Va., Roanoke	June 8	Improving portions of streets with concrete, macadam and bituminous macadam; also granolithic sidewalks	City Clerk.	
Miss., Houston	12.30 p.m., June 8	Grading and graveling 8.75 miles road	Board Co. Comrs.	
Cal., Sacramento	11 a.m., June 8	9.9 miles grading; 27 miles concrete road	Cal. Highway Commission	
Pa., Oil City	June 8	9,000 sq. yds. brick, asphalt block, or bituminous concrete paving, 7,100 ft. concrete curb and gutter, and 1,600 ft. sewers	B. B. Webber, City Engr.	
N. Y., Albany	1 p.m., June 8	Paving with various materials in several counties	J. N. Carlisle, Comr. Hwys.	
O., Cheviot	Noon, June 9	Macadamizing and otherwise improving streets	A. J. Rausing, Vil. Clk.	
D. C., Washington	June 10	Repairs to asphalt pavements	District Comrs.	
Tex., Temple	10 a.m., June 12	Constructing about 115 miles gravel road	Belle County Comrs.	
O., Cincinnati	Noon, June 12	Constructing culvert	Board Co. Comrs.	
N. D., Sherbrooke	2 p.m., June 12	26 miles of road construction	G. J. Mustad, Bd. Supr.	
O., Delaware	10 a.m., June 13	Grading, draining and paving	F. C. Higley, Co. Supv.	
Ind., Indianapolis	10 a.m., June 13	Gravel road	W. T. Patten, Auditor	
Ky., Lexington	June 15	Constructing roads with asphalt macadam, brick and concrete; cost, about \$200,000	J. W. Guyn, Auditor	
O., Antwerp	June 15	3/4 mile brick and concrete pavement, cost \$38,000	T. C. Banks, City Clerk.	
Tex., Waco	10 a.m., June 15	Constructing five roads and five bridges	W. T. Lockwood, Co. Aud.	
Tex., Harlingen	June 15	182,000 sq. ft. sidewalk; 21,350 ft. curb and 9,500 ft. curb and gutter	City Clerk.	
Ala., Mobile	Noon, June 15	Constructing 20,400 sq. yds. 2-inch asphaltic concrete on 4-inch concrete base	W. Smith, City Engr.	
Ill., Elgin	June 15	Paving with asphaltic concrete, 30,000 sq. yds.	M. H. Brightman, Engr.	
Ala., Mobile	Noon, June 15	20,400 sq. yds. 2-in. asphaltic concrete pavement on concrete base, 14,200 ft. of granite curbing	W. Smith, City Engr.	
Pa., Harrisburg	10 a.m., June 16	Paving with various materials in several towns	State Highway Dept.	
Ill., Breeze	8 p.m., June 17	Cement sidewalks and crossings. (See proposal ad)	C. C. Eulberg, City Clk.	
Minn., Shakopee	10 a.m., July 13	Road culverts	A. J. Meyer, Co. Auditor	
SEWERAGE				
Wis., Wittenberg	June 1	Sewer and water works, \$30,000	A. Johnson, Vil. Pres.	
Minn., Faribault	2 p.m., June 1	State purification plant	State Bd. of Control, St. Paul.	
Minn., Detroit	8 p.m., June 1	250 ft. sewer and 350 ft. water main	E. J. Bestwick, City Clk.	
Mont., Fort Benton	8 p.m., June 1	Constructing sanitary and storm sewer; also drainage system, consisting of vit. pipes, flush tanks, c. i. pipe, etc.	J. F. Murphy City Clk.	
Mont., Vallier	June 1	Constructing 5,000 ft. 12-in. and 10,000 ft. 8-in. pipe sewer, cost \$20,000	City Clerk.	
S. D., Mitchell	June 1	Lateral sewers, 6,611 ft. 8-in. pipe	City Auditor.	
N. Y., Glencove, L. I.	3 p.m., June 1	15 miles 6-15-inch vit. pipe sewer	Sewer Comrs.	
Mass., Gloucester	Noon, June 2	Building drain	Committee on Highways.	
Minn., Lakefield	June 2	Sanitary sewer and purification plant	R. J. Hill, Vil. Clk.	
Mont., Billings	June 2	Constructing sewer to cost \$17,000	City Clerk.	
Minn., Cloquet	5 p.m., June 2	Making sewer and water extensions	J. A. Parks, City Clk.	
Wis., West Salem	8 p.m., June 2	Four blocks of sewers, consisting of 931 6-in. and 896 8-in. and 4 manholes	S. W. Brown, Vil. Clk.	
N. Y., Brooklyn	11 a.m., June 3	Constructing sewers in several streets	L. H. Pounds, Boro. Pres.	
S. D., Armour	June 3	Constructing sewer system	City Auditor.	
Ill., Quincy	10 a.m., June 3	Constructing levee, open ditch, and 115,000 ft. 6 to 24-inch tile drain	W. P. Martindale, Secy.	
Ia., Montezuma	1.30 p.m., June 4	Sanitary vitrified pipe sewer	R. A. Mortland, Town Clk.	
Ind., Hammond	10 a.m., June 5	Constructing sewer	Board Public Works.	
Conn., Bridgeport	June 9	Constructing intercepting sewer	City Engr. Terry.	
O., Akron	June 16	Sewage treatment plant	Director Public Service.	
Iowa, Fort Dodge	1.30 p.m., June 12	About 825 ft. tile drain, intakes, etc.	L. J. Hanrahn, Co. Auditor	
Cal., Pasadena	About June 14	Various sewer improvement, cost \$10,000	R. V. Orbison, Dep. City Engr.	
Ill., Elgin	June 15	36,000 ft. 6 to 15-in. sewer	M. H. Brightman, Engr.	
Wis., Kenosha	2 p.m., June 15	500-foot 15-inch vit. pipe sewer	Street Assessment Com.	
Ala., Mobile	noon, June 15	Constructing 19,500 ft. 6-24-inch sewers, including 36 manholes, etc.	W. Smith, City Engr.	
Ala., Mobile	Noon, June 15	Storm sewer, about 19,500 ft., sizes from 6 to 24-in., including 36 manholes, 60 inlets and 12 basins	W. Smith, City Eng.	
N. C., Washington	June 17	Constructing 8 miles sewer and furnishing motor-driven centrifugal pump	Committee on Imp.	
La., New Orleans	June 17	15-ton hand operated crane, and constructing of drainage canal	F. S. Shields, Sec.	
S. D., Britton	8 p.m., June 18	Complete sewer system, including sewage treatment plant	G. G. Baker, City Aud.	
Neb., Norfolk	About June 25	Storm sewer; cost, \$2,000	H. H. Tracy, City Engr.	
N. J., Newark	2 p.m., June 25	Constructing Part 9 of main intercepting sewer	Passaic Valley Sew. Comrs.	
WATER SUPPLY				
N. J., Woodbury	7.30 p.m., May 31	Installing artesian well, water supply system	A. Starr, City Clerk.	
Alta., Calgary	June 1	Supplying steel piping	City Clerk.	
Pa., Altoona	June 1	Constructing distribution reservoir	Dir. H. J. Corman, Dept. Parks.	
B. C., Burnaby	June 1	Ten miles lap-welded steel water pipe	Municipal Clerk.	
Minn., Alexandria	7.30 p.m., June 1	Additions to water works system	C. J. Sunblad, City Clk.	
Ill., Freeberg	7 p.m., June 1	Improvements to municipal water works system	C. F. Kessler, Clk.	
S. D., Murdo	June 1	Furnishing 300 ft. water main	E. E. Lemon, Co. Aud.	
Alt., Calgary	June 1	Furnishing steel pipe	City Commissioners.	
Ill., Bushnell	June 1	Erecting 100,000-gallon tank on a 100 ft. tower	E. J. Dertinger, City Clerk.	
Kans., Washington	2 p.m., June 1	Water filtration plant	City Clerk.	
Ill., Bushnell	June 1	Constructing 1,000-gallon tank on 100 ft. tower	City Clerk.	
Ill., Freeburg	June 1	Improving water works with about 3,000 ft. c.-i. pipe, 1,800 lbs. c.-i. specials, motor-driven triplex pump, etc.	Village Clerk.	
S. D., Deadwood	7.30 p.m., June 1	Constructing concrete water tank	K. W. Trimble, City Aud.	
Mo., St. Louis	June 1	Constructing a mixing chamber in connection with valves, sluice gates	Board Public Imp.	
Minn., West Minn.	7.30 p.m., June 1	Water mains	A. A. Close, Village Recorder	
Tex., Beaumont	10 a.m., June 2	Reinforced concrete settling basin, six 500,000-gal. mechanical filter units, etc.	J. G. Sutton, City Sec.	
Minn., Hopkins	7.30 p.m., June 2	Water mains	E. A. Close, City Rec.	
H. T., Pearl Harbor	10 a.m., June 2	Cast-iron pipe, galv. pipe, fire hydrants, manhole frames and covers, etc.	Navy Dept., Washington, D. C.	
N. Y., Arkport	June 4	Installing water works system	Village Board.	
O., Springfield	Noon, June 5	100 tons of 6-inch Class "C" c.-i. pipe and fittings	C. E. Ashburner, City Mgr.	
Minn., Deer River	June 5	Quantity of c. i. pipe, hydrants, etc.	R. F. Beal, Clk.	

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Mass., Chelsea	.....11 a.m., June	6..	Heating and pumping plant	H. R. Stanford, Chief Bur. Yds. & Docks, Wash., D. C.
O., Glendale	.....Noon, June	8..	Extending height of standpipe 30 ft.....	Trustees of Public Affairs.
S. D., Veblen	.....June	9..	Constructing water works.....	City Auditor.
Va., Emporia	.....June	10..	Installing steel tower and tank, 200,000 gals. capacity.....	R. F. Whitaker, Sup. W. W.
Wis., Appleton	.....9 a.m., June	10..	Constructing steel tank and tower; capacity, 500,000 gals.; cost, \$25,000	F. L. Williams, City Clk.
Minn., Waterville	.....8 p.m., June	12..	Putting in water works system.....	A. W. Knaak, City Clk.
Ont., Toronto	.....June	16..	One or more 24,000-gal. centrifugal pumps and engines.....	Chmn. Board Control.
D. C., Washington	.....2 p.m., June	17..	Installing automatic sprinkler equipment in land office, etc.	L. C. Laylin, Asst. Sec. Int.
Md., Baltimore	.....June	17..	Constructing superstructure for buildings for water department	Board of Awards.
N. Y., Sidney	.....about July	1..	Constructing water works, cost \$125,000.....	Village Clerk.
LIGHTING AND POWER				
Sask., Saskatoon	.....noon, May	30..	Boilers, stokers, economizers and superheaters.....	E. Hanson, City Elec. Eng.
Ind., Ft. Wayne	.....May	30..	Additions to local lighting plant.....	City Clk.
Mont., Ft. Benton	.....June	1..	41 one-light and 8 three-light electroliners and 7,175 ft. of conduit and 22,000 ft. of wire.....	City Clerk.
Pa., Lansdale	.....June	1..	Yearly contract for Mazda lamps; tripe braided copper wire	Chmn. Elec. Light Dept.
Mont., Anaconda	.....8 p.m., June	1..	Erecting and equipping posts for lights.....	City Clerk.
Ill., Sterling	.....7 p.m., June	2..	Boulevard lighting system.....	Board Local Imp.
Ark., Little Rock	.....June	2..	Lighting fixtures, etc., for Capitol building.....	State Capitol Comsn.
Pa., Union City	.....June	3..	Furnishing one Ajax Gasoline engine, and one air compressor	H. D. Johnson, Secy.
N. J., Roselle Park	.....8 p.m., June	5..	Maintaining 130 32-c.p. lamps and 3 2,000-c.p. arc lamps in school building.....	Committee on St. Lighting.
Cal., San Francisco	.....June	10..	Furnishing and installing lighting fixtures in sub-treas.....	Supv. Arch., Wash., D. C.
Pa., Williamsport	.....noon, June	10..	Lighting contract, optional period. (See Proposal Ad.).....	S. C. Stabler, Supt. Pub. Wks.
Minn., Minneapolis	.....June	10..	Furnishing and installing special lighting fixtures in post office	Supv. Arch., Wash., D. C.
D. C., Washington Barracks	.....June	12..	Motor driven centrifugal pumps.....	Lt. Col. J. E. Kuhn, U. S. Engr.
La., Dubuque	.....July	2..	Providing changes in plumbing cond't and wiring system.....	Superv. Arch., Wash., D. C.
FIRE EQUIPMENT				
Pa., Williamsport	.....m., June	1..	One triple combination motor pumping engine. (See Proposal ad)	P. S. Harman, Supt. Pub. Safety.
Pa., Ford City	.....7.30 p.m., June	1..	Furnishing 1,000 ft. of hose.....	D. O. Crouce, City Sec.
N. Y., Dunkirk	.....June	1..	Motor triple combination wagon	Board Fire Comrs.
Pa., Bellevue	.....June	2..	1,000 ft. of fire hose.....	J. N. Simmeral, Sec. Council
Mass., Beverly	.....7 p.m., June	2..	1,000 ft. of double jacketed fire hose.....	Com. on Pub. Serv. & Aid.
Ind., Kendallville	.....2 p.m., June	2..	Constructing fire engine house.....	City Clerk.
Pa., Wilkinsburg	.....June	11..	Motor aerial truck	Borough Clerk.
La., Washington	.....8 p.m., June	19..	1,000 ft. 2½-in. 3-ply multiple woven fibre fire hose.....	F. P. Martin, Mayor.
BRIDGES				
Mass., Uxbridge	.....June	1..	Reinforced concrete bridge.....	L. S. Aldrich, Engineer
Cal., San Jose	.....June	1..	Reinforced concrete bridge	J. D. McMillan, Co. Surv.
Wis., Spruce	.....2 p.m., June	1..	Reinforced concrete bridge	J. Kadlec, Supv.
Ind., Shelby	.....10 a.m., June	2..	Repairing and constructing several bridges.....	F. W. Fagel, Co. Aud.
Minn., Martin	.....June	2..	82 concrete culverts, 6 reinforced concrete culverts, 500 lin. ft. 12-inch corrugated culvert.....	E. S. Sheppard, Co. Aud.
Colo., Denver	.....9 a.m., June	3..	Reinforced concrete superstructure and decking for viaduct	Board of Engineers
Fla., Jacksonville	.....10 a.m., June	3..	Constructing three concrete bridges	Co. Comrs.
N. Y., Charlotte	.....June	4..	Constructing bridge, cost \$75,000.....	Co. Comrs.
Wash., Ritzville	.....June	6..	Constructing four concrete bridges.....	Co. Comrs.
O., Cincinnati	.....June	12..	Constructing culvert	Board of Comrs.
Wyo., Sheridan	.....10 a.m., June	13..	Constructing reinforced concrete bridge.....	C. R. Wood, City Engr.
Ind., South Bend	.....June	15..	Constructing reinforced concrete bridge	Comrs.
MISCELLANEOUS				
O., Dayton	.....noon, June	1..	Building and furnishing 11 election houses.....	E. J. Bundenthal, Ch. Deputy.
Ind., Bloomington	.....2 p.m., June	2..	600 yards crushed stone delivered.....	W. F. Kinser, Co. Auditor
N. Y., New York	.....11 a.m., June	2..	Constructing 9 concrete, stone and brick superstructures.....	Comr. Water Supply.
Ill., Quincy	.....10 a.m., June	3..	Constructing levees, canals, etc.....	W. P. Martindale, Sec.
Fla., Jacksonville	.....8 p.m., June	4..	Supplying lubricating oil for one year.....	Board Bond Trustees.
O., Springfield	.....Noon, June	5..	One motor driven truck with dump body of 3 cu. yds. capacity, and one motor driven combination apparatus for sprinkling and sweeping streets	C. E. Ashburner, City Mgr.
Mo., St. Louis	.....Noon, June	5..	Erecting two ward buildings for hospital.....	Board Local Imp.
R. I., Newport	.....11 a.m., June	6..	Concrete float and wooden brow.....	H. R. Stanford, Chief Bur. Yds. & Docks, Wash., D. C.
N. J., Trenton	.....June	8..	Supplying in large quantities automobile identification markers	J. H. Lippincott, Comr. Motor Vehicles.
N. J., New Brunswick	.....2 p.m., June	8..	Remodelling and extending court house.....	City Clerk.
N. J., East Orange	.....8 p.m., June	8..	Maintaining scavenger system and disposing garbage.....	L. E. Rowley, City Clk.
N. Y., New York	.....12.15 p.m., June	9..	Constructing part Seventh Avenue subway.....	Pub. Serv. Comm., First Dist.
Ill., Springfield	.....June	15..	Erecting buildings and state institutions, also plumbing, heating, etc.	D. K. Whipp, Fiscal Supv.
Man., Winnipeg	.....June	15..	Street name posts and name plates.....	Chr. Board Control.
Ky., Jackson	.....3 p.m., June	17..	Constructing complete post office. (See Proposal Ad.).....	O. Wenderoth, Supv. Arch., Wash., D. C.

STREETS AND ROADS

Hamilton, Ala.—Steiner Bros., bankers, through their representative, J. M. Levine, have purchased from Marion County \$100,000 5 per cent. 30-year bonds. Proceeds from these bonds will be expended for building roads in Marion County.

Oakland, Cal.—Upon recommendation of Commissioner of Streets Baccus, City Council adopted plans and specifications for improvement of various streets.

Oroville, Cal.—Board of Trustees ordered plans and specifications for bituminous street paving adopted and ordered work done. Sixteen blocks in business section are to be paved. Advertisement

for contracts will be ordered at next regular meeting of City Board.

Quincy, Cal.—Supervisors have decided to improve Plumas-Reno road from Beckwith to Chilcoot, and thence to state line. Estimated cost of improvement is \$7,000. Supervisors will proceed with work as funds are available.

Santa Rosa, Cal.—Citizens of Sonoma County are in favor of bonding county for \$1,500,000 for construction of new roads.

Sonoma, Cal.—State highway commission has rejected bids of W. E. Booker and W. H. Newell for construction of proposed new state highway between Knights Ferry and Keystone. The two above named were lowest bidders, but their figures were considered more than

15 per cent. higher than estimate of state engineer.

Willows, Cal.—Supervisor H. D. Wylie of Butte City, and Supervisor J. S. Sale of Elk Creek will try road sprinkling this summer as road preservative. Wylie will sink three county wells and put up tanks to hold sprinkling water, and Sale will bore one.

Bridgeport, Conn.—Street paving bonds in sum of \$200,000 have been voted.

St. Augustine, Fla.—Bids for \$650,000 good roads bond issue will be asked again by official advertisement, to be opened on seventeenth of June.

Joliet, Ill.—Bids have been rejected as too high for replanking Will-Grundy bridge over Kankakee river northwest

of Larengo. New bids will be received on May 26.

Quincy, Ill.—Paving on Jersey street is being urged. Resolutions providing for this improvement will probably be presented to council together with ordinances—one providing for paving between Twelfth and Fourteenth with brick blocks and other for paving between Fourteenth and Twenty-fourth with concrete base and bituminous coal tar compound filled macadam wearing surface.

Bluffton, Ind.—The Studebaker Bank, of this city, have purchased eight of nine issues of highway improvement bonds.

Fort Wayne, Ind.—Calhoun street, from Rudisill boulevard to McKinnie street, will be paved with anchored bituminous concrete, unless property owners petition for some other style of pavement. Grace Construction Co. submitted only bid. A petition was received and filed for paving of Webster street, from De Wald to the Wabash railroad.

Fort Wayne, Ind.—A block of county stone road bonds, amounting to \$18,000, has been sold to J. F. Wild & Co. of Indianapolis at \$165.

Greensburg, Ind.—Highway improvement 4½ per cent. bonds to amount of \$5,200 have been sold here to Miller & Co., of Indianapolis.

Huntington, Ind.—Resolution has been passed for paving of four streets. Nature of pavement has not been decided. Many residents of Roanoke ask that streets be paved with concrete paving materials. Four materials are included in plans and specifications.

Mishawaka, Ind.—Board of Public Works and city engineer, after carefully examining Lincoln Highway, have recommended that street be resurfaced with asphalt and preliminary resolutions were prepared for making of such an improvement.

Muncie, Ind.—County Treasurer Williamson has sold \$32,800 worth of Delaware County road bonds to Merchants National Bank of this city.

Noblesville, Ind.—County treasurer has sold two issues of gravel road bonds. Issue of \$6,200 on Webb highway was bought by Citizens' State Bank of this city. Issue of \$1,920 on the Carey road was sold to J. F. Neal, of this city.

North Vernon, Ind.—Gravel road improvement bonds of Jennings County, amounting to \$6,150, have been sold by County Treasurer Henry Harman to First National Bank of Vernon for \$6,189.

Plymouth, Ind.—The Fletcher American National Bank of Indianapolis, and C. A. Reeve of Plymouth were successful bidders on 4½ per cent. township stone roads bonds sold by county treasurer in sums of \$15,900 and \$13,600.

Richmond, Ind.—Petition for paving of North 7th St. from A St. to Fort Wayne Ave. with reinforced concrete, signed by twenty of thirty resident property owners, has been presented to Board of Public Works.

South Bend, Ind.—Election will be held in Warren, Olive, German and Portage townships, St. Joseph's county, May 28, in matter of Lincoln Highway West. Proposed roadway is 63,470 ft. long and estimated cost \$193,724.75.

Terre Haute, Ind.—Contracts have been let by Board of Public Works for improvement of 18 streets at cost of \$440,000. On May 22 people of Harrison township, in which Terre Haute is situated, will vote on proposition to improve number of highways from city limits to outer boundary of township at cost of \$400,000.

Clinton, Ia.—Council has ordered city engineer to prepare plans for paving Second street, from 10th avenue to 13th avenue, with vitrified brick blocks; also the opening of Grand avenue, from Springdale cemetery to Eighth street, and Eighth street, between Fourth and Fifth avenues.

Louisville, Ky.—System of 500 miles of roads have been mapped out by engineers. Bond issue of \$300,000 will be voted on.

Baton Rouge, La.—At meeting of police jury of East Baton Rouge parish, gravel was decided upon as material for three model highways which will be constructed out of Baton Rouge to surrounding country and concrete for all bridges and culverts.

Bar Harbor, Me.—It has been voted to authorize the Selectmen to enter into contract with State Highway Commission to build road in accordance with plans and specifications on file with commission. Specifications filed with highway commission call for macadam road only about a mile and a quarter of which can be built for \$12,000. Road

from Burns' corner to the bridge is about two and a half miles in length.

New Bedford, Mass.—On recommendation of committee on roads, bridges and sewers, aldermen have ordered sewers in following street, and appropriations amounting to \$11,800 to build them: Luke street, from Rockdale avenue westerly, petition of Manoel Lucas and others, \$3,000; sewer loan No. 1, 1914. Topham street, from Harvard to Highland street, petition of Henry S. Gorner and three others, \$2,500; sewer loan No. 1, 1914. Princeton street, from Bowditch street westerly, petition of Emile Belanger, 500 feet west of Bowditch, \$1,300; sewer loan No. 1, 1914. Mill street, between Lindsey and Florence streets, petition of Anna K. Greene, \$1,100; sewer loan No. 1, 1914. Church street, from present terminus northerly to Central street, petition of Louis J. Robitaille, \$1,100; chapter 183, acts of 1913. Carroll street, from Brigham street westerly, petition of Manuel T. Perry, \$1,000; chapter 131, acts of 1913. Wood street, from present terminus westerly to Bowditch street, petition of Arthur Landry and others, \$2,000; sewer loan No. 1, 1914.

Niles, Mich.—City of Niles and South Bend, Ind., will join in rebuilding a 10-mile stretch of highway between the two cities.

Little Falls, Minn.—Street Committee has been instructed to investigate advisability of purchasing minimum car of road oil from Standard Oil Co. at a cost of 5.36 cents per gal. Bids were advertised for some time ago, but none were received.

St. Joseph, Mo.—Proposed paving of Hyde Park avenue, from King Hill avenue to east limits at Ninth street, will complete driveway consisting of country roads and city streets, which will be four or five miles in length.

St. Joseph, Mo.—Ordinances have been passed providing for improvement of various streets by grading and paving. J. E. Gates is City Clerk. Fred Lander is Clerk of Board of Public Works.

Asbury Park, N. J.—Oiling of several streets at cost of about \$3,000 is being considered.

Atlantic City, N. J.—County Engineer Nelson has been instructed by Board of Freeholders to make survey and estimate cost of two roads across meadows which if built would greatly shorten distance between Atlantic City and other municipalities lying to north and also to south. One of these proposed roads is boulevard from Somers Point to Longport and other is boulevard from Absecon to Venice Park.

Camden, N. J.—Ordinance has been passed directing paving of Cleveland avenue, from 27th to 29th streets, with sheet asphalt on 6-inch concrete foundation. W. D. Brown is clerk.

New Brunswick, N. J.—Resolution has been adopted for paving, curbing and repairing sidewalks on about 54 streets. T. T. Curran is street commissioner.

New Brunswick, N. J.—At meeting of freeholders bids were received for repairing of first section of Roosevelt-Carteret Rd. Plans for this road were recently approved by the State Road Commissioner. Bids were referred to county engineer. They were as follows: Conrad Sebolt, this city, total lump sum, \$27,857.78; Citizens Construction Co., of Trenton, \$31,682.80; Standard Bitulithic Co., New York, \$39,375.92; Thomas F. Dunigan, Woodbridge, \$27,950.47; Thomas H. Riddle, this city, \$26,990.

Paterson, N. J.—Forty-eight county roads are going to be oiled during coming summer for purpose of laying dust. Contract for oil has already been awarded to Standard Oil Co., whose bid was .0120 per sq. yd., and was lower than any other bid offered.

Trenton, N. J.—An ordinance has been passed to authorize paving of Market street from point about eighty-three (83) feet south of Lamberton street to South Warren street with bituminous concrete, with concrete gutters and blue stone or concrete curbs or both; provided, however, that there shall be laid two lines of granite block of good quality along the outer rails of tracks of Trenton and Mercer County Traction Corporation and that all that part of said street lying between rails and between tracks of company shall be paved with granite block of good quality, laid on a stone ballast, which shall consist of four inch broken stone ballast beneath the ties, and concrete between each tie and for two inches above the top of the ties. Ordinances have been passed authorizing that Tremont street from Hancock street to Home avenue be paved with bituminous concrete on a five-inch concrete base, and concrete gutters, with con-

crete or stone curbs or both. That Swan street from Hudson street to Chestnut avenue shall be paved with vitrified brick on a five-inch concrete base, with concrete or stone curbs or both. That Clark street from Hamilton avenue southerly about six hundred (600) feet to the beginning of the present belgian block pavement, shall be paved with vitrified brick on a five-inch concrete foundation, with stone curbs. Frank Thompson is city clerk.

Niagara Falls, N. Y.—Bids have been ordered advertised for pavements in Michigan Ave. from 15th to 22nd St., at cost of \$21,200 and in Linwood Ave., from 18th to 22d St., at a cost of \$10,625. Bids are returnable June 2.

Oneida, N. Y.—Board of public works have rejected all bids for oiling streets. The superintendent of public works has been authorized to do the work under supervision of board of public works.

Rochester, N. Y.—Following first ordinances have been presented and adopted: Rowley St., asphalt pavement, \$16,000; Springfield Ave., grading, walks and sewer, \$13,000; Wilson St., grading, walks and sewer, \$5,100; Lilac St., grading, walks and sewer, \$10,000; Culver Rd., pavement, \$12,900; McBeth St., grading, walks and sewer, \$2,800; Murray St., brick pavement, \$6,000; Texas St., brick pavement, \$7,000; Westminster Rd., asphalt pavement, \$13,000; Vick Park Ave., A, asphalt pavement, \$9,000; Culver Rd., asphalt pavement, \$15,200; Culver Rd., asphalt pavement, \$24,000; Harvard St., asphalt pavement, \$6,000; Baron St., asphalt pavement, \$3,600; Clinton Ave. North, sewer, \$9,000; Joseph Ave., Medina block; Acorn St., opening and extension, \$800. Following final ordinances have been adopted: Alkinson St., asphalt pavement, estimated cost \$20,000; Hastings St., retaining wall, \$3,000; Magee Ave., pavement, \$25,000; Park View, grading, \$321; Arnold Park, care and embellishment, \$440; removing iron lamp posts from Crosman Terrace, \$490; additional lighting for Crosman Terrace; Murray St., brick pavement, \$13,000; Winterroth St., pavement, \$17,000; Newcomb St., pavement, \$5,000; Genesee St., cement walks, \$800; Kron St., grading and sewer, \$5,500; Superior St., walks, \$350; Judson St., walks, \$500; Utica Pl., sewer, \$1,200.

Rome, N. Y.—Special meeting of Board of Public Works has been held. Object of meeting was to act on certain streets which it is designed to have paved this year. These are Jay between Dominick and Embargo, the estimate for which is \$13,605.42; River from Dominick St. to St. Peter's Ave., estimate \$10,203.18; John St., estimate \$12,734.15. Bids will be advertised for on asphalt and bitulithic paving and public hearing will be held at next regular meeting on June 3.

Rome, N. Y.—City Clerk A. L. Mac-

Master has sold at public sale, City of Rome paving bonds in aggregate principal sum of \$17,808.04.

Watertown, N. Y.—State highway department is advertising for bids for constructing part 3 of Cape Vincent-Watertown Rd., 8.36 miles. Bids will be received up to 1 p. m., June 8, at highway office in Albany. Maps, plans and specifications may be seen at office of commission or at local division office in this city.

Watertown, N. Y.—Resolution will be adopted asking board of water works to give public works board 11,000 cubic yards of crushed stone from its water power development project, for use on the city streets. It is planned to improve 12,500 lineal feet of streets this summer, and for this 40,000 square yards of macadam are required. Amount appropriated is only \$10,660, whereas at 60 cents per square yard sum of \$24,000 would be required. Resolution to be adopted will ask following amounts of crushed stone from the board: For base of streets, stone of two and one-half inches or over, 7,000 cubic yards; stone of from one inch to two inches, 3,000 cubic yards; screenings and dust, 1,000 cubic yards.

Columbus, O.—Council has passed ordinance to repair High St. at cost of \$100,000.

Columbus, O.—No bids have been received by Highway Commissioner James R. Marker for paving of National Pike with brick of that portion of road in Richland, Union and Kirkwood townships of Belmont county, distance of 16.62 miles, estimated cost of which is \$422,955.74, which, with other two sections of road in same county, made total contract go over \$619,000. Assurances have been given that bid within estimate will be given when letting is again made on June 2. For paving road a distance of 3.61 miles bids were received within the estimate on widths of 16 feet; 21

feet and 4 inches, and on width of 24 feet, the lowest bids being respectively: \$85,951, \$111,730 and \$123,960. For making roadway a distance of 4.20 miles, contract for brick was let at \$103,785. Two roads advertised for in Crawford county were not let, bids being withheld because the character of improvement is to be changed to brick instead of water-bound macadam, and county will increase its road program to approximately \$100,000 instead of \$18,000, at which the jobs were estimated. Contracts entailing over a million dollars will soon be in force for reconstructing old National road in Ohio. Highway commissioner estimates that no less than \$15,000,000 will be spent by state and various counties in Ohio for road improvements this year, state alone spending approximately six millions on highways that are to receive state aid.

Columbus, O.—Bids will be received by state highway commissioner at 2 p. m., June 2, for grading and paving following streets: Belmont Co., pet. 810, I. C. H. 1, paving with brick; length, 87,751 ft.; national road, Richland, Union and Kirkwood Twp., Guernsey Co., pet. 661, I. C. H. 26, paving with concrete, Steubenville-Cambridge road, Cambridge Twp.; length, 5,280 ft. Campaign Co., pet. 830, I. C. H. 190, paving with w. b. macadam, Piqua-Urbana road, Mad River Twp.; length, 8,024 ft. Defiance Co., pet. 574, I. C. H. 420, paving with w. b. macadam, Hicksville-Defiance road, Hicksville and Mark Twp.; length 33,300 ft. Gallia Co., pet. 741, I. C. H. 7, paving with brick, Ohio River road, Gallipolis Township; length, 4,800 ft. Hardin Co., pet. 1325, I. C. H. 227, paving with w. b. macadam, Kenton-Forest Ext. road, Pleasant Twp.; length, 1,490 ft. Huron Co., pet. 1086, I. C. H. 290, paving with concrete, Oberlin-Norwalk road, Wakeman Twp.; length, 5,640 ft. Huron Co., pet. 1086, I. C. H. 290, paving with concrete, Oberlin-Norwalk road, Townsend Twp.; length, 13,602 ft. Huron Co., pet. 1092, I. C. H. 289, paving with concrete, Bellevue-Norwalk road, Ridgefield Twp.; length, 8,630 ft. Montgomery Co., pet. 976, I. C. H. 19, paving with brick, Cincinnati-Dayton road, Van Buren Twp.; length, 12,621.3 ft. Paulding Co., pet. 1399, I. C. H. 427, paving with concrete, Payne-Hicksville road, Carryall Twp.; length, 2,981 ft. Trumbull Co., pet. 763, I. C. H. 150, paving with concrete, Niles-Ashtabula road, Mecca Twp.; length, 14,910 ft. Williams Co., pet. 743, I. C. H. 305, paving with w. b. macadam, Bryan-Defiance road, Pulaski Twp.; length, 5,335 ft. James R. Macher, state highway commissioner.

Loudon, O.—Trustees of Loudon township have sold \$12,000 of road improvement bonds to Security Savings Bank & Trust Co. of Toledo.

Poteau, Okla.—Campaign for purpose of issuing \$154,000 bonds to build good roads under one of most elaborate schemes ever attempted in eastern Oklahoma has been commenced. Bonds are to be floated by six townships, Cameron, Kully, Poteau, Wister, Howe, Heavener and Shady, largest towns in county, are embraced in these townships. Cameron is to vote on \$18,000 bonds, Kully \$15,000, Poteau \$21,000, Wister \$35,000, Howe \$16,000, Heavener \$18,000 and Shady \$21,000, a total of \$144,000. City of Poteau is to vote on \$10,000 bonds.

Astoria, Ore.—Word has been received from Salem announcing that State Highway Commission has authorized expenditure of \$56,000 of state funds for hard surfacing 10 miles of road between Astoria and Seaside, and road work will soon be under way in this county calling for outlay of \$500,000.

Bandon, Ore.—City Council of Bandon has decided to pave main street of town.

Beaver, Pa.—Under direction of supervisors of White township, surveyors have completed survey of new road in that township. The new extension is one mile long and begins at Towns-and corner.

Boyertown, Pa.—Council has decided to pave five streets at cost of about \$19,000.

Erie, Pa.—Two ordinances have been passed as follows: Providing for grading, draining, etc., of 23d St. from French St. to Parade, to cost \$13,000; providing for laying out and opening of 14th St. from Poplar to Plum St., making 40-ft. street.

Philadelphia, Pa.—Ordinances providing for opening of Parkway between Sixteenth and Seventeenth streets and between Nineteenth and Twenty-second streets will be introduced at session of Council. Property which is assessed at \$470,850 will be taken by condemnation proceedings by city, according to present plans.

Reading, Pa.—Following bids have been received by Council for paving alleys: Joseph O. Sherry, Wyomissing—Glen Gery block, \$2.18 square yard; John K. Faust, Glen Gery or Hamburg block, \$2.05; Auburn, \$2.10; Pinegrove, \$2.10; John E. Weidner, for paving alley between Locust and Twelfth streets, and Oley and Douglass streets, Glen Gery block, \$2.00; Frank and Ralph Yocum, trading as Yocum Bros., Glen Gery block, \$1.99 per square yard. Cleaning paving streets—Yocum Bros., 16 feet driveway, \$9 per square per month; 24 feet, \$12; 30 feet, \$13; 34 feet, \$17.05, and 48 feet, \$17.30. Cleaning each basin or sewer inlet, \$2.50. Extra flushing per square yard, \$1.50. John A. Rauhen bid \$13.50 per square a month to clean all paved streets, regardless of width, and 90 cents for cleaning catch basins or inlets.

York, Pa.—County Commissioners have decided to approve petition for construction of about four more miles of improved highways with state aid in lower end of York county. Proposed improvements will begin at southern limit of Stewartstown and extend to North Hopewell township line, distance of 20,534 feet. Portion of road in Hopewell township totals 15,264 feet.

Charleston, S. C.—City Engineer J. H. Dingle has tabulated bids that were opened by committee on streets for tearing up and hauling of Belgian blocks and cobblestones on streets that are to be paved with more modern material. Bids for tearing up Belgian blocks, per square yard, were as follows: R. M. Hudson, of Atlanta, who has the contract for laying the sheet asphalt paving, awarded recently, 3 cts.; Louis Lawson, of Norfolk, who has the contract for laying creosoted wood block paving recently awarded, 3 cts.; H. W. Bischoff, of Charleston, 1½ cts.; Dan Fortune, of Charleston, 5 cts. Bids for tearing up cobbles, per square yard, were as follows: R. M. Hudson, 2 cts.; Louis Lawson, 5 cts.; H. W. Bischoff, 1½ cts.; Dan Fortune, 5 cts. Bids for hauling the blocks and cobbles a distance of 3,000 ft. were as follows: R. M. Hudson, 14 cts.; Louis Lawson, 9 cts.; H. W. Bischoff, 13 cts.; Dan Fortune, 13 cts. Bids for hauling the same each 500 ft. additional were as follows: R. M. Hudson, 2 cts.; Louis Lawson, 1½ cts.; H. W. Bischoff, 2 cts.; Dan Fortune, 1 ct. A. L. Moission submitted bids as follows: For tearing up and hauling for distance of 3,000 ft., either blocks or cobbles, 20¼ cts.; for hauling either material, each 500 ft. additional, 20¼ cts.

Sioux Falls, S. D.—It has been decided to pave Minnesota Ave. with asphaltic concrete.

Sioux Falls, S. D.—Thirty-five blocks of pavement, covering 48,014 sq. yds., are now under contract to be done this spring, and City Commission will probably let the contract shortly for paving of Minnesota Ave.

Chattanooga, Tenn.—Paving bonds of city in amount of \$50,000 have been disposed of by Mayor Thompson to Citizens' National bank and the Hamilton National bank at par.

Knoxville, Tenn.—Morgan County has voted \$275,000 of bonds to build pike roads. More than one hundred miles of roads in county have already been graded. Bonds will be issued by July court.

Wartburg, Tenn.—Work will begin putting on macadam on roads in Morgan County shortly after July term of court. This county has spent recently \$50,000 for grading its roads and has now voted bond issue of \$275,000.

Austin, Tex.—The Attorney General has approved one of largest road bond issues which has come before department in many years. It was for \$1,075,000 of McLennan County bonds. It is proposed to use proceeds of this issue to build 185 miles of macadam, concrete and gravel roads, which will intersect three incorporated towns—Waco, Lorena and West.

Bogata, Tex.—Improvement of street is being planned.

Bonham, Tex.—Bond issue of \$250,000 has been voted for construction of good roads.

Clarksville, Tex.—City has voted bonds in sum of \$250,000 for street pavements and other municipal work.

Denison, Tex.—City contemplates construction of pavements. A. B. Clemy is City Engineer.

Denton, Tex.—Another petition for \$300,000 road bond election in this precinct has been presented to Commissioners' Court.

Holland, Tex.—Issue of \$105,000 good road bonds issued by Holland road district of Bell County has been sold to

highest bidder, Pearson & Taft, of Chicago.

Houston, Tex.—Upon motion of W. H. Kiser, county engineers were ordered to prepare plans and specifications for four miles on Air Line road and for four and a half miles on Kuykendall road.

Kaufman, Tex.—At meeting of Commissioners' Court, election was ordered to be held in Kaufman Justice Precinct No. 1 on June 20, for issuance of bonds amounting to \$200,000 to build good roads.

La Pryor, Tex.—The \$10,000 good roads bond issue voted on in Precinct No. 4 of Zavala County has been carried unanimously.

Rogers, Tex.—Citizens of this precinct have voted issuance of highway bonds in sum of \$250,000. About sixty miles of macadamized roads will be constructed from proceeds of this election and work will commence as soon as bonds can be disposed of.

San Antonio, Tex.—Now that Bexar County has received last money derived from \$1,000,000 bond issue, improvements contemplated under this issue are being pushed by County Commissioners. While number of roads have already been improved under issue for road improvements totaling \$250,000 bids for greater part of work, covering approximately 78 miles, will be opened shortly. This work is expected to cost about \$200,000. Bids for culverts on these roads are also to be opened. Roads to be bid on and length to be improved are as follows: Corpus Christi Rd., 7½ miles; Pleasanton Rd., 3¼ miles; Applewhite Rd., 4¼ miles; Somerset Rd., 2¼ miles; Quintana Rd., 4 miles; Pearsall Rd., 4 miles; Castrovilla Rd., 8¼ miles; Protranco Rd., 7½ miles; Culebra Rd., 6¼ miles; Blanco Rd., 8 miles; Nacogdoches Rd., 6¼ miles; St. Hedwig Rd., 4 miles; Gonzales Rd., 4¼ miles, and the Sulphur Springs Rd., 5 miles.

San Antonio, Tex.—In Road District No. 1, Wilson County, taxpayers will vote on \$60,000 good roads bond issue June 23. If good roads enthusiasts carry election modern trunk highway will be constructed across county to connect with similar road in Bexar County. Number of lateral roads also are contemplated under proposed bond issue.

San Marcos, Tex.—Bonds in sum of \$100,000 have been issued for improvement of roads of county.

Sutherland Springs, Tex.—The Commissioners' Court has ordered formation of Wilson County Special Road District No. 1, and called election for bond issue of \$60,000. Election will be held June 23.

Charleston, W. Va.—At special election issue of \$465,000 in civic improvement bonds was authorized by city of Charleston. Proceeds will be used for street paving and sewer improvements.

Tacoma, Wash.—Bids will be opened by County Board this week for paving road from Buckley to Sumner, 10 miles. Asphaltic top will be laid on about 4 miles of this road. The remaining 6 miles will be paved with asphalt and whole job will cost approximately \$88,000. As soon as preliminary bids have been made and initial contracts awarded, work of making surveys will begin.

Milwaukee, Wis.—Bids for asphalt paving contracts totaling \$125,000 have been opened in office of Public Works Department. Streets to be improved are Greenfield Ave., Congo Ave., Shepherd Ave., Cleveland Ave., 26th Ave., and Lincoln Ave.

Bridgeburg, Ont.—Sum of \$7,000 has been voted for macadamizing roadways.

Niagara Falls, Ont., Can.—City Engineer Anderson in compliance with resolution of City Council has submitted estimate on cost of proposed pavement from north to south end, and also on plant with which to construct it. There are 48,085 sq. yds. of pavement to be laid. Anderson estimates that pavement could be built of Mack block for \$3.35 per thousand for \$148,225.50. This would include sewer connections, catch basins and 20,000 lineal feet of concrete curbing at 38 cents per foot. His estimate on Metropolitan or Bessemer block at \$29 per thousand is \$138,603.68, including sewer connections and other work involved. Plant required to lay pavement would cost about \$11,105. It would include paver, complete with rotary distributor, steam power and self-propelling, all tools, concrete storage shed, sand and crushed stone elevators. Such plant would have a capacity of from 160 to 180 sq. yds. of pavement per hour.

CONTRACTS AWARDED.

Clanton, Ala.—By Chilton county commissioners, contract for grading 12-mile section of Montgomery-Birmingham highway to W. H. Wynn, Dadeville, Ala. This section of road building extends from Clanton to Mountain Creek, and when completed practically finishes highway from this point to Montgomery.

Oakland, Cal.—Bids have been opened by board for altering county highway in Moore canyon, Palomares road district. Contract for work was awarded to Thomas B. Russell, whose bid was \$637.50.

San Francisco, Cal.—For paving Embarcadero from pier 26 to pier 32 to Fay Improvement Company at \$51,769.10, lowest of eight bids submitted, of which highest was \$65,913.

Freeport, Ill.—Gund-Graham Co. of Freeport contract for brick paving that is to be done this season at Stockton. Freeport contractors were lowest bidders, at \$17,000.

Freeport, Ill.—By park commissioners to Gund-Graham company of Freeport, contract for macadamizing Empire street to Globe park, stretch of about half a mile. Contract price is \$2,200.

Waukegan, Ill.—Two paving block contracts have been awarded to Chicago Creosoting Company of this city. Contracts include supplying of paving material for paving operations in cities of Chicago and St. Paul, Minn., Contract of city of St. Paul includes manufacture of almost 190,000 square yards of paving blocks. Paving blocks that will be furnished city of Chicago will total in neighborhood of 40,000 square yards.

Girard, Kan.—Joseph Doyle, of Walnut, has secured contract from Board of County Commissioners for building 12 concrete culverts on county roads, places not designated, at cost of \$7.50 a cu. yd. These are to be of 3 to 10-ft. span and 20 ft. wide. Also he contracted to put concrete floor on Cummins bridge near Walnut for \$7 a cu. yd., county to supply steel supports.

Lafayette, Kan.—The E. W. Geiger Co., Salem, Ore., has been awarded contract for paving Oak and 6th Sts., their bids being \$1.52 and \$1.51 respectively.

Salina, Kan.—By Council for paving East Walnut St. with fibre brick and asphalt filler to Kaw Paving Co., of Topeka.

Topeka, Kan.—To Capital City Vitri-fied Brick & Paving Co. contract for paving grounds surrounding Union Pacific freight depot in North Topeka. Paving will cost about \$8,000.

Augusta, Me.—Following bids have been opened Thursday afternoon by the State Highway Commission; Bids for Fryeburg section, 6.93 miles of gravel: R. & J. McGregor, Rumford, \$59,854.34; Lavorgna & Puchio, Rumford, \$39,897.34; Fred E. Ellis, Melrose, Mass., \$51,562.67; Long, Little & Russell, Boston, \$44,001.60; John W. Gulliver, Portland, \$59,456.90; James H. Kerr, Rumford, \$34,272.70.* Contract was awarded to James H. Kerr of Rumford. Bids for Woolworth Section, No. 1, 2.99 miles of gravel: Small & Ingalls, Bar Harbor, \$22,799.40; Ahern Construction Co., Willimantic, Conn., \$15,940.15.* Contract awarded to Ahern Construction Co. of Willimantic, Conn. Bids for Woolworth Section, No. 2, 2.66 miles of gravel: John G. Fleming, Lincoln, \$19,590.35; Amos D. Bridges Sons, Hazardville, Conn., \$16,925; Fred E. Ellis, Melrose, Mass., \$15,165.10.* Contract awarded to Fred E. Ellis of Melrose, Mass. Bids for the Wiscasset Section, No. 1, 2.35 miles of gravel: John G. Fleming, Lincoln, \$13,294.61.* Contract awarded. Bids for the Wiscasset Section, No. 2, 1.60 miles of gravel: Small & Ingalls, Bar Harbor, \$14,829.70. No award made.

Baltimore, Md.—Contracts have been let by State Roads Commission for oiling entire mileage of State roads now constructed. About 425 miles of improved road will be treated with heavy coating of oil and covered with grit or stone chips. Approximate cost of oiling for which contracts have been let will be \$130,000. As stated, 425 miles will be treated, there will be used 1,250,000 gallons of oil and 22,000 tons of chips and grit. In letting contracts Roads Commission used several engineering residences as units, and contracts, in detail, are as follows: Salisbury residency, No. 1, 48-1 miles, requiring 120,843 gals., approximate cost \$9,491.57; and Easton residency, No. 2, 27.67 miles, requiring 83,260 gals.; approximate cost, \$6,463.29; let to the United Bas Improvement Co., of Philadelphia, applying "Ugite B." Chestertown residency, No. 3, 43.98 miles, requiring 109,827 gals., approximate cost, \$8,894, and Baltimore residency No. 4, in part, 44.12 miles, requiring 145,786 gals.; approxi-

mate cost, \$11,311.28; let to Walter Cressy, Gloucester, Mass., applying "Trinidad A." Frederick residency, No. 5, 68.72 miles; requiring 199,022 gals.; approximate cost, \$14,329.57, and Hyattsville residency, No. 7, in part, 5.28 miles, requiring 16,520 gals.; approximate cost, \$1,122.25; let to Good Roads Co., of Baltimore, applying "Aztec." Cumberland residency, No. 6, 69.64 miles; requiring 204,280 gals.; approximate cost, \$15,884.18; let to Sands, Kline & Co., Morris-town, N. J., applying "Texaco Special." La Plata residency, No. 8, 18.72 miles; requiring 45,354 gals.; approximate cost, \$3,487.72; Hyattsville residency, No. 7 in part, 66.48 miles; requiring 2,055,885 gals.; approximate cost, \$15,192, and Baltimore residency, No. 4, in part, 19.16 miles, requiring 61,957 gals.; approximate cost, \$4,292.61; let to Barrett Manufacturing Co., Philadelphia, applying "Tarvia B."

Boston, Mass.—For paving with bitu-lithic Avery St. to Coleman Bros., at \$9,215.

Middleton, Mass.—To John Gaffey of Medford, contract to build next section of state road on North Main street, in this town.

Pittsfield, Mass.—By board of public works, contract for tar to Barrett Mfg. Co. of New York, and for Portland cement to C. C. Gamwell.

Grand Rapids, Mich.—Carpenter & Anderson, 310 Shepard Bldg., Grand Rapids, contract for improving Franklin street from South Lafayette avenue to Division avenue with brick for \$16,244.58. Bids for work on other streets were as follows: Grading and graveling Elm street, H. A. Hoxie, low bidder, \$2,640.51; Houseman street, T. W. Boyer, low bidder, \$13,316.10; Lafayette avenue, O. P. Carpenter, low bidder, \$9,795.39; Goodrich street, Hilding & Robey, low bidders, \$946.88.

Floodwood, Minn.—Two contracts for road construction in Floodwood district have been awarded to local men. W. A. Baune's bid for constructing one and one-half miles of Lake road being accepted on following basis: For clearing and grubbing, \$600 per mile; for grading firm ground, 75 cents per rod; swamp ground, 32 cents cubic yard; culverts, \$3 each; corduroy, \$2 per rod, and covering muskeg with firm earth, 50 cents per cubic yard. Victor Rantila was awarded contract for constructing two miles of Blackwood road, northwest from Gowan, for lump sum of \$2,530.

Le Sueur Center, Minn.—By county commissioners, for 16,273 cubic yards grading, 14,660 lineal feet turnpiking, 3,182.9 cubic yards graveling, to John Keogh, St. Peter, at \$6,266. J. W. Hruska is district engineer.

Park Rapids, Minn.—For constructing Elwell road from Park Rapids to Nevis, to Jas. Wilkins, at \$15,455.

St. Paul, Minn.—Portland Cement Co. was lowest bidder for curbing in St. Anthony Park North, at \$24,600 for work estimated by engineers to cost \$20,167.75. O'Neill & Preston bid \$32,865. All bids may be rejected on this job.

St. Louis, Mo.—For paving with brick Bartmer Ave., University City, to F. M. McMahon, Wainwright Bldg., at \$22,000, and contracts have been awarded by Bd. Public Improv. for paving as follows: Wood block construction: Delmar Blvd., from Taylor Ave. to Kings Highway, Skrainka Constr. Co., Security Bldg., \$21,343.03; 7th St., from Broadway to Park Ave., Fruin-Colnon Contr. Co., Merchants-Laclede Bldg., \$86,999. Telford with oil treatment, granitoid curb and gutter: Bradley Ave., from Ivanhoe Ave. to Frisco Ave., to Webb-Kunze Constr. Co., 5927 Fyler Ave., St. Louis, \$13,426.05; Bruno Ave., from Forest Ave. to Western City Limits, Frank T. Adler, Holland Bldg., \$4,742.65. Brick reconstruction: McNulty St., from 18th St. to Vail Place, Evermann Constr. Co., 1216 S. Grand Ave., \$2,221.

Flemington, N. J.—The Hunterdon County Board of Freeholders has received bids for construction of Flemington section of Flemington-Frenchtown macadam road and New Germantown road, about 5½ miles in length. Contract was awarded to J. L. Lacompte, of Lakewood, for \$72,189.40. Other bids were as follows: The Citizens' Construction Co., Trenton, \$94,070; Sigafoss & Poor, Riegelsville, \$82,666.78; Burke & Bonham, Plainfield, \$91,376.06; M. Irving Demarest, Sewaren, \$74,978.66, and Kelly & McPeely Co., Camden, \$90,375.34. Bids were also opened for construction of about three and a half miles of macadam road from Stryker's Crossing on Whitehouse-Lebanon Rd. to New Germantown. Contract was awarded to M. Irving Demarest Sewaren for \$37,573.25. Other

bids were as follows: John McNabb, Bound Brook, \$50,323.42; J. L. Lacompte, Lakewood, \$45,642.52; Humphrey and Bently, Elizabeth, \$42,553.35; C. H. Winans & Co., Elizabeth, \$46,985.99; Citizens' Construction Co., Trenton, \$52,018.70; Burk & Bonham, Plainfield, \$42,283.60; Charles T. Eastburn & Co., Yardley, Pa., \$55,762.98; Weldon Construction Co., Rahway, \$48,733.90, and Richard Gaston & Co., Somerville, \$54,536.26.

Linden, N. J.—Bids for laying sidewalks in various streets in borough have been received by Borough Council and contract awarded to Fred McGill-wray at 67 cts. per lin. ft.

Passaic, N. J.—To De Vogel Contracting Co., contract for asphalt-bound macadamizing of Burgess place and extending of storm water sewer on that street.

Roselle, N. J.—The C. H. Winans Co., Elizabeth, N. J., has been awarded contract for macadamizing 6th Ave. by Borough Council. Company's bid, \$3,011.19, was lowest of five received. Other bidders and amounts were: P. Camello & Co., \$3,026.30; Charles Lentz, \$3,052.28; Weldon Contracting Co., \$3,197.59; Humphry, Humphry & Bently, \$3,097.77.

Gloversville, N. Y.—To Albert M. Banker, Johnstown, for 5,700 yards concrete pavement, \$10,110; 2,800 yards brick pavement, \$9,294; and sewers, \$5,059. H. J. Hammer is city engineer.

Ithaca, N. Y.—Contract for paving of North Tioga St. has been awarded to Manning & Stryker of Elmira and Troy. They will do work for approximately \$7,800.

New York, N. Y.—For furnishing wood paving block to Dept. Bridges to American Creosoting Co., 95 Liberty St., at \$6,812.

Rochester, N. Y.—Contract for asphalt pavement in Bonivard St. has been awarded to Julius Friedrich at \$12,430. Petrel St. asphalt pavement went to same firm for \$4,061. Vassar St. asphalt pavement was awarded to Rochester Vulcanite Co. for \$4,326. Contract for Wilcox St. asphalt pavement was awarded to Frank Brotsch for \$3,277.

Schenectady, N. Y.—Following bids have been received for repairing, patching and resurfacing of street pavements: Schenectady Contracting Co., for wearing surface, including binder course, excavation and removal of old material, in sections of 100 yds. and more, \$1.29 per sq. yd.; less than 100 yds., \$1.39 per sq. yd. For 6-in. concrete foundation, \$7 per sq. yd. For 5-year guarantee, 50 cts. per sq. yd. Union Paving Co., for wearing surface, etc., in sections of 100 yds. or more, \$1.14 per sq. yd.; less than 100 yds., \$1.24 per sq. yd. For foundation, 96 cts. per sq. yd. For guarantee, 7 cts. per sq. yd. J. E. Shanley Co., for wearing surface, \$1.25 and \$1.28 per sq. yd. For foundation, 85 cts. per sq. yd. For guarantee, 5 cts. per sq. yd. T. R. Crane, for wearing surface, \$1.90 and \$2.05 per sq. yd. For foundation, 90 cts. per sq. yd. For guarantee, 45 cts. per sq. yd. Contract was awarded to Union Paving Co. The Crane-Veeder Co. was awarded contract for repair and relaying of granite block pavement in State St., between Lafayette St. and Grove Pl. Other bidders were: George W. Van Vranken, whose bid was 77 cts. per sq. yd., and Union Paving Co., whose bid was \$1.18 per sq. yd. The Crane-Veeder Co. bid was 62 cts. per sq. yd.

Columbus, O.—Four road contracts have been let by county commissioners. C. H. Walcutt will improve Glen Ave. roadway for \$1,427. The Stimmet Rd. in Jackson and Pleasant townships will be macadamized by Thomas Trugh for \$11,523. A portion of King Ave. from Orlentangy bridge to township line will be paved by E. E. Sullivan & Son for \$2,947. Highway Construction Co. will macadamize rest of road for \$7,222.

Dayton, O.—Contracts have been awarded as follows: Paving of Herman Ave. from Forest Ave. to river, Yount and Jackson, at their bid of \$19,788. Paving of Virginia Ave. from Wyoming St. to Connecticut Ave., to Clifton Hoolihan, \$8,794.90.

Elmore, O.—For 6,930 sq. yds. block pavement, etc., to A. Witte, Elmore, O., at \$15,976. Other bidders were: Modern Constr. Co., Fremont, \$16,532; G. A. Weir, Elmore, \$16,215; Morsman & Green, Grand Rapids, Mich., \$16,440; Rimesplach & Thoma, Fremont, \$16,990. Wm. Haley is Village Clk.

Elyria, O.—For paving with brick on Oak, S. Forest and Mechanic Sts., and College Pl., to Lininger & Bennett, Con-neaut, at \$21,452.

Green, O.—Green township trustees have awarded two road building contracts. First runs from Greenford to Toots Corners, 16,432 ft., to Fleming

Hahn & Platt, for \$18,152. Road from Greenford to New Albany Rd., 12,388 ft., was awarded to same parties for \$13,718.46. Both roads will be built of macadam, with furnace slag surface.

Astoria, Ore.—To BoyaJohn-Arnold Co. of Portland, contract for clearing, cleaning and grading 28 miles of road between Astoria and Westport, which connects with portion of highway in Columbia county. Contract was let on unit basis and it is estimated that total cost will be much below figures submitted for flat contract.

Oil City, Pa.—For paving with brick, concrete curb and gutter as follows: To Burns Bros., New Castle, Bissel avenue, \$13,045, and Harriett avenue, \$4,996; to Pierce & Hinterliter, Oil City, for Pine street, \$5,245, and Division street, \$4,548.

Wilkes-Barre, Pa.—By Hanover township commissioners, for paving of township roads, to Michael T. Malloy of Sugar Notch, at \$87,000. The Mack brick has been chosen as block for the work. Ordinance for this work provided for paving of many miles of highway, curbing and establishing of water basins on several streets already paved with macadam.

Wilkes-Barre, Pa.—Contract has been awarded to John E. Jones for paving South Sherman street, between East Northampton and East South streets, with Clearfield bricks, at \$2.26 a cubic yard. He is also to set White Haven red stone curbing at 78 cents a lineal foot.

Providence, R. I.—To Franklin Contracting Company of New York, contract for wood block paving Franklin street by Board of Contract and Supply. Price is \$9,081.31. Other bidders for this work were the Narragansett Improvement Company, United States Wood Preserving Company and Famiglietti Brothers.

Pierre, S. D.—Contract has been let to John Dierling of Eureka for 13,000 yards of grading on McPherson county roads, at 18 cents a yard.

Sioux Falls, S. D.—Three more big paving contracts, totalling nearly 51,000 sq. yds. of new street construction, have been let by City Commissioners. Three awards were made as follows: Minnesota Ave., 48,000 sq. yds. asphaltic concrete to Fielding & Shepley, of St. Paul, on their bid of \$1.55½ per sq. yd., including all construction, grading and excavation. The Ford Paving Co. of Cedar Falls were second lowest bidders at \$1.57½ per sq. yd. North Duluth Ave., between First and Third Sts., about 900 sq. yds. of paving, asphaltic concrete; contract awarded to the Ford Paving Co., of Cedar Rapids, Ia., on their bid of \$1.581 per sq. yd., including all construction, excavation and grading. The Atkinson Construction Co., of Watertown, S. D., was second lowest bidder at \$1.633 per sq. yd. Ninth St., between Dakota and Minnesota Aves., about 2,000 sq. yds., will be paved with granite blocks with an asphaltic filler under specifications "C" outlined by the city engineer. The contract was awarded to the Atkinson Construction Co., of Watertown, S. D., on their bid of \$3.53½ per sq. yd., including all grading and other preparatory construction.

Chattanooga, Tenn.—The West Construction Co. and the Key-Arnold Co., both of Chattanooga, Tenn., are successful bidders on paving to be done on Chestnut and adjoining streets. Paving is to be done with vitrified brick. Bid of West Construction Co. was lowest for paving of Chestnut St. from 26th to Missionary Ave. Its bid was for \$15,444.10. Contract for paving of 26th St. from Chestnut to Whiteside Sts. was awarded to West Construction Co. at \$6,633.90. Contract for paving of Main St., between Carter and Whiteside Sts., was awarded to Key-Arnold Co. at \$14,181.95.

Dallas, Tex.—By County Commissioners' Court, to Cullom & Bayousett, contract for paving Dallas-Oak Cliff viaduct with creosoted wood blocks, upon their bid of \$60,749.96.

Galveston, Tex.—Contract for paving of Broadway east from 11th St. to the seawall boulevard and west from 29th to 39th St. has been awarded to Isaac Heffron of Galveston. Contract price for entire work was \$69,632.75.

Houston, Tex.—Contracts have been awarded by county commissioners as follows: Brunner streets, 2½ miles, Suderman & Dolson of Houston, \$3,107.50; 6,000 cubic yards shell at \$8.53, Brunner, W. D. Hayden; 4,000 cubic yards gravel at \$1.50, Janetia, W. Waldo; Richmond road, Texas Grading Co., \$6,700; 4,000 cubic yards gravel at \$1.50, W. Waldo. Austin Bros. were awarded contract for grader at \$265.

Houston, Tex.—Contracts for roads and bridges involving \$34,112.25 have been awarded by County Commission-

ers. Largest contract was for construction of Washington County Rd. It was granted to W. S. Hipp of Houston on his bid of \$13,751.25. Other road contracts were awarded as follows: Crosby and Dayton Rd. with shell, Davis & Hughes, \$9,880, contract for material to Couch & Holliger to supply 12,000 cu. yds.; Harrisburg Main St. cut off road (Griggs Rd.) with gravel, W. A. Scott, \$7,026; Baker St. Rd. with gravel to Texas Grading Co. at \$1,475, contract for material to Couch & Holliger. Appropriation of \$11,200 has been made for paving of Louisiana from Dallas to Capitol, and contract for work awarded to Uvalde Rock Asphalt Co. of New York. Sum of \$5,000 has been appropriated for paving of Polk from Milam to Smith. Contract for paving was awarded to Uvalde Rock Asphalt Co.

Salt Lake City, Utah.—Complete tabulation of bids on paving of Third Ave. and Thirteenth East shows that Strange & McGuire are low bidders with their bid of \$2.12 per square yard on bitulithic pavement on both large contracts. The Gilkerson Construction company was next lowest bidder on Third avenue and Northern Construction company was next lowest on Thirteenth East. Bid of Strange & McGuire on Third avenue was \$83,737.22 and their bid on Thirteenth East \$58,213.88. Bids by other contractors were as follows: Third avenue—Gilkerson \$85,395.07, Moran \$85,633.59, Mullen \$85,802.13, Northern \$87,756.96, preliminary estimate \$85,931.75. Thirteenth East—Northern \$59,989.59, Moran \$60,715.17, Mullen \$60,987.26, preliminary estimate \$58,726.08. Recommendation probably will be made to city commission that two paving contracts be awarded to Strange & McGuire.

Norfolk, Va.—Board of Control has authorized Walter H. Taylor, assistant city engineer, to accept bid of Louis Lawson of Norfolk for constructing 1,100 sq. yds. of bituminous concrete pavement on eastern end of 48th St., Tenth Ward, at \$1.40 a sq. yd.

Kenosha, Wis.—State highway commission at Madison has given its sanction to contracts for road work in Kenosha county and approved bonds of Contractors Mockler and Darrow of Waukegan and George R. Wade of Kenosha. Contracts now let call for expenditure of \$32,000 on Geneva road, work to be done by Waukegan company; \$23,000 on Burlington road, and \$5,000 on Somers road, all of work to be done by George R. Wade. Commission also directed that contracts be let for expenditure of \$12,000 on Lake Shore road, \$1,500 on Sheridan road and \$5,500 on South Park avenue road. These roads will all be improved with concrete.

Milwaukee, Wis.—For paving by Comr. Pub. Wks. as follows: With creosote blocks, Lisbon Ave.; with sandstone, Isl. and Ave., 3d and Johnson Sts., to Hase & Weiher, at \$30,530; with creosote blocks, Lee St., to J. H. Donahue, 318 Bradford Ave.

Somers, Wis.—For constructing Burlington and Somers Rd., to Geo. R. Wade, Kenosha, at \$26,650.

Two Rivers, Wis.—For paving with macadam 3 miles streets by Bd. Pub. Wks. to W. O. Bahr, Manitowoc, at \$32,275.

SEWERAGE

Bridgeport, Conn.—Sewer bonds in sum of \$300,000 have been voted.

Bridgeport, Conn.—Committee on Sewers has reported and ordered construction of 12 new sewer wells in as many different sections of city, and also instructed Director of Public Works to make repairs to others.

Fort Wayne, Ind.—Resolutions have been adopted for construction of various sewers.

Peru, Ind.—Council has decided to investigate matter of purchasing sewer cleaning machine.

Augusta, Me.—It has been ordered that sewer be built on Northern avenue beginning at junction of Northern avenue and Kendall streets and running north on said Northern avenue distance of about 1,000 feet.

Pittsfield, Mass.—Board has voted to lay 150 feet of sewer and water pipe on Daniels avenue and several crosswalks.

Fenton, Mich.—A special meeting of Common Council has been held to ask for bids for constructing trunk line sewer for Fenton. Village clerk was instructed to have plans of proposed system made and to advertise for bids. Sewer will start at corner of East St. and Shiawassee Ave. and will run to Shiawassee river and then along river about 4,000 ft. to village limits.

Flint, Mich.—Mayor MacDonald and City Clerk Newcombe have signed sew-

er and public improvement bonds totaling \$215,352.24. Bonds will be delivered to Spitzer-Rorick Banking Co. of Toledo, O. Issue is divided as follows: Sewers, \$153,800; street improvement (paving), \$39,073.64; street improvement (graveling), \$22,478.60.

St. Paul, Minn.—Board of Public Works has approved and will send to Council for final action the big Snelling-Como sewer project, involving expenditure of about \$300,000. Before recommending project for final action Board cut out Bartlett court from Wheeler to railroad; Wheeler from Marsh court to Gibbs, and Breda from Snelling to Prior.

St. Joseph, Mo.—Ordinance has been introduced in council by J. W. Holtman for sewer in district No. 141, in South St. Joseph. As proposed sewer is to begin at Fourth street and Hyde Park avenue, and extend east along the avenue to Eighth street, then northeasterly and east along Noyes avenue to Ninth street.

North Bend, Neb.—Plans are under way for new sewerage system that will cost \$16,000.

Cranford, N. J.—Township Committee has received from Sewer Engineer Feurtes detailed report and plans for rebuilding parts of present sewer system, together with recommendations for purification plant. Plans will be submitted to State authorities for approval, after which township authorities may call special election to vote upon bond issue to make necessary repairs and improvements.

Plainfield, N. J.—An ordinance has been adopted to provide for construction of further addition to system of sewerage already constructed in city of Plainfield. P. H. Stewart is Mayor.

Perth Amboy, N. J.—Ordinances to construct several sewers in northwestern section of city have been introduced.

Ridgefield Park, N. J.—Lederle & Provost, of 39 W. 38th St., have been retained to prepare complete plans for remodelling sewerage system and for installation of treatment works.

Charlotte, N. Y.—Charlotte Village Board has rejected bids on construction of sewer and laying of pavement for Beach avenue. Bids were opened at last meeting of Board and it was found that combination bid by Julius Friederich and H. Feanclosa was low at \$33,333.26. Next lowest bid was that of Whitmore, Rauber & Vicinus at \$37,725.1.

Goshen, N. Y.—Bids on Goshen sewer system and disposal plant have been presented to Board of Trustees of village, 15 bids in all being presented. They varied from \$92,000 to \$160,000, and beside these bids over 35 propositions were made. Two lowest bidders on system are Fred Gross, of Yonkers, whose bid on entire system was about \$92,000, and John W. Heller of Newark, N. J., who bid about \$94,000. These bids are all above estimate made by Clyde Potts, the sewer expert, his estimate being about \$88,000, which makes lowest constructing bid at least \$4,000 more than proposed estimate.

Goshen, N. Y.—It has been decided to reject bids for construction of sewer system as too high.

Schenectady, N. Y.—Bids are to be advertised for another batch of sanitary sewers.

Akron, O.—Bids will be received on June 16 for sewage disposal plant, consisting of sedimentation tanks and sprinkling filters. R. Winthrop Pratt, of Cleveland, is engineer.

Canton, O.—Bids will be received on May 26 for sewage disposal plant, consisting of sedimentation tanks and contact beds. R. Winthrop Pratt, of Cleveland, is engineer.

Cleveland, O.—Bids will be received on July 1 for sewage disposal plant, consisting of grit chambers and five screens. This plant will accommodate district furnishing about 1-16 of total flow of sewage of city. The grit chambers are of temporary construction, and screens will be placed in a temporary wooden basin and will not be paid for until they have fulfilled claims of makers. R. Winthrop Pratt is engineer.

Mount Vernon, O.—Construction of sanitary sewer on Norton St. is being considered.

Beaver, Pa.—Council will be compelled to pass ordinances for laying of sanitary sewers in side streets. There are 43 city blocks on which sewers are unprovided.

Pawtucket, R. I.—Sum of \$1,600 has been appropriated for construction of sewer in Slack's lane from Broadway to Main St.

Woonsocket, R. I.—Resolution appropriating \$18,349 and adding same to appropriation for sewer construction work has been passed in concurrence by board of aldermen. Sewers are to be con-

structed in Grove street, Carrington avenue, Logee street, Dulude avenue, River street, Fairmount street, Grand street and Elm street.

Galveston, Tex.—Bond issue to be sold for improvement of sewer and water-works departments is \$150,000.

Salt Lake City, Utah.—Sewer bonds in sum of \$100,000 will be sold at 5 p. m., June 8. S. C. Park is Mayor and K. A. Scheid is City Recorder.

Charleston, W. Va.—Bonds in sum of \$465,000 have been authorized for sewer improvements and street paving.

Monroe, Wis.—Common council has passed resolution allowing for issue of \$10,000 worth of bonds for extension of sewer system.

CONTRACTS AWARDED.

Vallejo, Cal.—By City Council to Michael Murphy, Berkeley, for intercepting sewers from Carolina and Butte Sts. to outfall at Main St. at \$8,500.

Bradentown, Fla.—For constructing 3 miles of storm sewers on Roesch Ave. to Southern Asphalt & Constr. Co., Birmingham, Ala. S. C. Corwin is Comr. Public Works.

Berwyn, Ill.—For constructing sewers in 65th and other streets to Chas. M. Porter Co., 118 N. La Salle St., Chicago. Cost about \$20,000.

Toulon, Ill.—By Bd. Local Improv. for sewers and sewage treatment to Geo. A. Mallory & Co., Kewanee, as follows: 3100 ft. 12 in., 55 cts.; 3100 ft. 10-in., 49 cts.; 11,210 ft. 8-in., 40 cts.; 5364 ft. 6-in., 36 cts.; 700 ft. house drains, 6-in., 49 cts.; 66 manholes, ea., \$27; 7 flushtanks, ea., \$60; total for sewer, \$12,182, and purification works, \$7,500; grand total, \$19,683. Totals of next 3 lowest bids: C. M. Hanes, White Hall, \$20,562; Porter-McUlly Constr. Co., \$21,586; R. A. Medaris Constr. Co., Girard, \$23,658. Engineer's estimate, \$23,583.

Marion, Ind.—By Bd. Public Wks., for combined sewer to Michaels & Minnick Constr. Co., at \$35,450. Frank R. Heck is City Clk.

Richmond, Ind.—Contract for building so-called Morton park sewer system, which is for benefit of entire northeastern section of city, went to local contractor F. L. Slick, on bid of \$30,385.

Alexandria, La.—City Council has accepted bid of Gray & Short of Ruston, La., for \$10,970.80 for extension of sewerage system. Contract for furnishing sewer pipe was let to Texarkana Pipe Co., of Texarkana, for \$9,093.12.

Baltimore, Md.—One of the largest contracts offered by Sewerage Commission this year is in competition before Board of Awards when James Ferry & Sons, Carroza Bros. & Co., McCarthy & O'Herron, the Whiting-Turner Construction Co. and Gallagher, Boyle & O'Brien bid on \$100,000 job for sanitary sewer construction. Carroza Bros. & Co. seem to be lowest bidders at their total proposal of \$99,900. Bonds will be tabulated later by Sewerage Commission.

Baltimore, Md.—For Stormwater Contract 39 to McCarthy & O'Herron, 14 N. Olive St., at \$18,195.25. Calvin W. Hendrix is Chief Engr.

Amesbury, Mass.—For building sewer system to C. E. Trumbull Co., 73 Tremont St., Boston, at \$28,000.

St. Paul, Minn.—To Thornton Bros., contract for Griffith-Terry sewerage system by Board of Public Works for \$65,787. City engineer's estimate was \$64,764. Highest bid was that of Doherty & Sons, \$88,770. E. T. Webster, at \$45,800, was low on Ocean St. sewer job. Engineer's estimates were \$51,676, and the high bid by P. J. Ryan, \$67,000.

Perth Amboy, N. J.—To Carl Poulsen, the only bidder for placing 10-in. sewer in Donald Ave., at \$2.28 a lin. ft. and to furnish manholes for \$45 each.

Niagara Falls, N. Y.—To Nick Nolfe contract for sewer in Niagara St. to cost about \$500.

Schenectady, N. Y.—To Thomas F. MacGregor contract for laying of surface water sewers in Avenue B, Gerling St., Beaver St., Raymond St. and Seneca St., also contract for sewers in Hampton Road, Hampton outlet, Wright Ave., Keyes Ave., Milton Ave., Oakland Ave., William St., Plum St., and Regal Ave.

Providence, R. I.—To Valley Company, Sidney, N. Y., contract for laying of sewers in Daniels and Ticonderoga avenues, figures being, respectively, \$2,377.30 and \$935.10. Antonio Aiello was awarded contract for sewer in New York avenue on bid of \$1,145.47.

Houston, Tex.—Appropriation of \$1,000 has been made to cover cost of construction of sanitary sewer on Gano from Loraine to Waverly. Contract for this work was awarded to Hunter and Hunter, Oklahoma City, Okla. For construction of sanitary sewer on Robins

from Hunter to Smith appropriation of \$2,500 was made. Freund and Quay, Galveston, Tex., received contract for this work. Council appropriated \$900 to cover cost of constructing sanitary sewer extension from Eastwood Ave. to McKinney Ave. Contract for this work to Horton and Horton, Houston, Tex. For construction of sanitary sewer on Bagby from McKinney to Rusk, appropriation of \$1,750 was made. Baldwin and Regan obtained contract.

Milwaukee, Wis.—Six contracts have been awarded by city for sewers in 3 sections of city at total cost of \$42,000, to following: Thos. Szukalski, Newman Hohensee, F. H. Nakielski, Jos. Forrestal, G. E. Zimmermann and Hiram Johnson.

WATER SUPPLY

Tehama, Cal.—Plans for new municipal water system being prepared by County Surveyor Luning provide for mains reaching twenty-five blocks. A well is to be sunk adjacent to present pumping plant on the river bank. Twenty-one fire hydrants will be provided. Cost of installation will be about \$10,000, covered by bond issue.

Michigan City, Ind.—Krechbiel Co., of Chicago, Ill., will prepare plans and specifications for remodeling and otherwise improving city water supply.

Arkansas City, Kan.—Election will be held June 10 for voting on \$97,000 bond issue for extending waterworks and enlarging plant. Burns & McDonnell of Kansas City, Mo., are engrs.

Greensboro, Md.—By big majority voters of Greensboro have authorized bond issue of \$20,000 to establish water-works.

Pittsfield, Mass.—Board has voted to lay 150 ft. of water and sewer pipe on Daniels Ave. and several crosswalks.

Forsyth, Mont.—Election has been called for June 15 for voting on \$15,000 bond issue to improve city waterworks system.

Lewistown, Mont.—The Empire Bank and Trust Co. of this city has bought the \$90,000 waterworks bond issue.

Norfolk, Neb.—City Engineer Tracy is making everything ready for council to act on new \$10,000 water main extensions. Blue print maps of locations of extensions and estimate of cost are being prepared in engineer's office.

Springview, Neb.—Proposition to vote water bonds will be submitted in near future.

Linden, N. J.—Linden Water Co. may construct water works to cost about \$300,000. Plans are not yet prepared.

Morristown, N. J.—J. S. Rippel, of Newark, was successful bidder for \$35,000 issue of bonds for improvements to water and light plants, and for purchase by Board of Water Commissioners of Chatham of additional water lands.

Binghamton, N. Y.—Plans for improving water system are being considered by Engineer Nicholas Hill, Jr.

Lackawanna, N. Y.—Preliminary steps towards building of municipal water system will soon be taken by Mayor John Widmer. At request of Mayor, plans have been drawn by Maxwell Briggs, Commissioner of Public Works, for municipal water system. Plan is to build a reservoir in the hills near Hamburg and supply city with water by gravity system. It is estimated that cost of such system will be about \$250,000, but with city's present population it is believed that it would be self sustaining.

Lestershire, N. Y.—Water commissioner has received verbal report from Consulting Engineer Firestone of Rochester on proposed improvement of water works. His plan includes addition and installation of new Corliss engine.

New Paltz, N. Y.—Village has sold its issue of \$49,500 water works bonds to Home Savings Bank of Albany.

Schenectady, N. Y.—Plans and specifications for proposed two-unit reservoir to be erected on Bevis Hill in Niskayuna has been presented by City Engineer William B. Landreth. They were approved and will be sent to Albany for approval of state department of health and conservation commission.

Schenectady, N. Y.—Bureau of water has been authorized to purchase water meters in open market to amount of \$5,000.

Portsmouth, O.—Bids will be received until June 2 by City Auditor for \$50,000 water works extension bonds.

Youngstown, O.—Service Director Heasley has announced that city would

advertise for bids for three turbine and one reciprocating pump for new water works pumping station.

Lafayette, Ore.—As special meeting of Lafayette City Council Robert W. Jones, of McMinnville, was awarded contract to furnish plans and specifications for municipal water plant. He will begin survey at once, and will also supervise entire construction from start to finish.

Aspermont, Tex.—At election held here to determine whether or not city should issue \$20,000 in bonds for purpose of putting in water works system, proposition carried by unanimous vote. As soon as bonds can be issued and disposed of work will begin on system.

Galveston, Tex.—Bond issue to be sold for improvements of the waterworks and sewer departments is \$150,000.

Salt Lake City, Utah.—Bonds in sum of \$200,000 for water works improvements will be sold at 5 p. m., June 8. S. C. Park is Mayor & K. A. Scheid is City Recorder.

Kirkland, Wash.—Bids will be received until June 1 by City Council for \$18,000 bonds for constructing water system. Reitze, Storey & Duffy are Engrs., Northern Bank Bldg., Seattle.

Toppenish, Wash.—Improving and extending water works to cost \$18,000 is being considered. C. H. Green Co. are Engrs., Spokane. C. A. Wyckoff is City Clerk.

Janesville, Wis.—By vote of 1,091 to 302 voters of Janesville have decided question favorably for purchase of Janesville Water Company.

Niagara Falls, Ont., Can.—Stamford Council has given notice of initiation of water mains for proposed new water works system in various streets.

Niagara Falls, Ont.—Bids will be called for by water commissioners on construction of two water mains, one in Maple avenue, the other in Homewood avenue.

CONTRACTS AWARDED.

Sanger, Cal.—To Hall & Hunt, Fresno, by Board City Trustees for constructing sewer system and water works at \$56,162.

Boone, Ia.—Contract awarded May 13 for 25,000 ft. 4-in. water mains, hydrants and valves to Andrew G. Anderson, Boone, at \$13,772. Otto Hile is City Clk.

Boston, Mass.—For laying water pipe as follows: 4, 6, 8, 10, 12, 16-in. pipe in Brighton and Dorchester, to Roger P. Cushing, 445 Washington St., Dorchester, at \$10,265, and laying 13,600 lin. ft. 6 to 16-in. pipe in Roxbury, West Roxbury and Hyde Park, to John Guarino, Brook Ave., Roxbury, at \$10,374.

Pittsfield, Mass.—By Board of Public Works contract for valves to Chapman Valve Co., of Indian Orchard, and for 14,500 ft. of galvanized pipe to A. M. Byers Mfg. Co.

La Grange, Mo.—For constructing water works, from plans of J. P. Davis, Windsor, to C. M. Hanes, Whitehall, Ill., at \$15,460. Other bidders: Commercial Constr. Co., Kansas City, \$15,990; J. A. Pringle, Monroe City, \$16,147; V. E. Koch, Joplin, \$16,186; Monie & Dunbar, St. Louis, \$16,290. Carroll Bozarth is City Clerk.

Moorestown, N. J.—Following contracts were awarded for water works improvements from plans of Alex. Potter, 50 Church St., New York: Furnishing and delivering c. i. pipe and special castings to U. S. Cast Iron Pipe & Fdry. Co., at following bid: 377 tons 10-in. c. i. pipe, \$20; 131 tons 8-in., \$20.50; 4.4 tons 6-in., \$21.50; 2.8 tons 4-in., \$23.50; 5.6 tons c. i. specials, \$55; total, \$10,693. Other bids—R. D. Wood & Co., \$10,787; Standard Cast Iron Pipe Co., \$11,135. Laying water main from pumping station to water tank, to Bell Bros. Co., Haddonfield: Laying 11,810 lin. ft. 10-in. c. i. pipe, 25 cts.; 5,470 lin. ft. 8-in., 20.5 cts.; 256 lin. ft. 6-in., 17 cts.; 250 lin. ft. 4-in., 12.5 cts.; 150 cu. yds. additional excav., \$1; total, \$4,299. Three next lowest bidders: W. G. Fritz Co., Newark, \$5,242; Kelly-McFeeley Co., Camden, \$5,472; Antonio Cocco, Philadelphia, Pa., \$5,528. General improvements to Young & Hyde, New York, as follows: 1,500 cu. yds. earth excav., 52 cts.; 200 cu. yds. wet earth excav., 92 cts.; 430 cu. yds. excav. for siphon well, \$1.95; 10 cu. yds. concrete in thin walls, Class A, \$12.65; 127 cu. yds. concrete in roofs, beams, etc., Class A, \$9.15; 612 cu. yds. concrete in walls and footings, Class A, \$7.53; 120 cu. yds. concrete in floors, Class B, \$6.15; 1,200 bbl. cement, \$1.80; 56,000 lb. steel reinforcement, 3.5 cts.; 750 sq. ft. No. 26 triangular mesh, 5 cts.; 92 lin. ft. 6-in. c. i. pipe, 82 cts.; 100 lin. ft. 8-in., \$1; 300 lin. ft. 12-in., \$1.45; 245 lin. ft. 14-in., \$1.80; 28 lin. ft. 16-in., \$2.25; 69 lin. ft. 16-in. c. i. pipe taken up and relaid, \$1.45;

12,500 lb. specials, 4.7 cts.; 1,000 lin. ft. 3-in. vitrified pipe underdrain, 35 cts.; 2,400 lbs. wrought iron and steel, 6 cts.; pump and siphon well equipment (lump sum), \$5,870; 100 hp. boiler and 2 superheaters (lump sum), \$3,790; pump well superstructure (lump sum), \$300; venturi meter and register (lump sum), \$700; total, including valves, etc., \$26,849. Other bidders: Suburban Eng. Co., New York, \$26,951; Kelly-McFeeley Co., Camden, \$31,476; Citizens Constr. Co., Trenton, \$36,364.

Morris, N. Y.—For construction of water works to Snell & Co., Canajoharie, at \$20,000.

Rowland, N. C.—Following contracts have been awarded by Mayor and Council: To R. D. Cole Mfg. Co., Newnan, Ga., boilers, tank and tower; Ball Eng. Co., Erie, Pa., engine; Western Erie Co., Atlanta, generator, switchboard, regulator, transformers, pole line, hardware, John H. McGowan, Cincinnati, fire pumps; Platt Iron Wks., Dayton, O., centrifugal pump, motor and boiler feed pump; Harrison Safety Boiler Wks., Atlanta, Heaters; Southern Iron & Equipment Co., Atlanta, steel castings; Chattanooga Sewer Pipe & Fire Brick Co., Chattanooga, Tenn., sewer pipe; Hughes Spec. Well Drilling Co., Charleston, S. C., well; Lynchburg Pipe & Fdry. Co., Lynchburg, Va., cast iron pipe; Crane Co., Washington, D. C., lead, jute, etc. J. B. McCrary Co. are engs., Atlanta, Ga.

Clearfield, Pa.—By Clearfield Water Co., for spillway and core walls for Montgomery reservoir, to M. Applegate & Son, Bradford, at \$11,501. Other bidders: R. J. Breckenridge, Grove City, \$14,561; Drake & Dean, Inc., Buffalo, N. Y., \$12,619; Curwensville Con. Co., Curwensville, \$13,696. Chas. C. Hopkins, Engr., 349 Cutler Bldg., Rochester, N. Y. Itemized bid of M. Applegate & Son, successful bidders, is as follows: 600 cu. yds. excav., 5 ft. deep, 85 cts.; 200 cu. yds., 5-10 ft., \$1.25; 70 cu. yds., 10-15 ft., \$2; 70 cu. yds., 15-20 ft., \$2.75; 60 cu. yds., 20-25 ft., \$3.50; 585 cu. yds. rock excav., \$3.50; 850 cu. yds. concrete, 1:3:5, \$8; 1,520 lbs. steel rods, 6 cts.; 1,000 lin. ft. drill holes for grouting, \$1.

Bryan, Tex.—To Fred Standard, League City, for drilling an 8-in. well of not less than 180 nor more than 300 ft. deep to supplement city water system.

Pullman, Wash.—Pacific Tank & Pipe Co., Portland, Ore., for 70,000 gal. tank for municipal water works, and for 4000 ft. of 4-in., 2300 ft. of 6-in. and 1000 ft. of 8-in. c. i. water pipe to Hughes Co. of Spokane.

Niagara Falls, Ont., Can.—The Stamford Council has accepted bid of Chicago Bridge and Iron Co. for standpipe for new waterworks system at \$3,170. Huge tank will stand 100 feet in air and will hold 100,000 gallons.

Victoria, B. C.—By City Purchasing Agent for furnishing 10,000 ft. 4-in. steel pipe to Evans, Coleman & Evans, Victoria, at \$26.58 per 100 ft.

LIGHTING AND POWER

Oakland, Cal.—The Vernon-Rockbridge Improvement Club has filed petition with City Council, asking that they be granted permission to install 56 electrolights along College Ave. for 13 blocks in center of Vernon-Rockbridge district and requesting city to pay for maintenance of lights. Cost of electrolights and installation of lights would be \$4,000.

Springfield, Ill.—City Commissioners have authorized installation of ornamental lighting system on Adams St. in the downtown section to cover about twelve blocks. Ornamental standards carrying one lamp will be used.

Sterling, Ill.—Boulevard lights will be installed. The new system of lights will be modern, the very latest, in street lighting. System to be installed is high power efficiency madza light, commonly called nitrogon filled. A single light on a handsome post. Each light will have at least 500 candle power, and if desired by merely replacing lights, illumination can be increased or decreased.

White Hall, Ill.—City is contemplating installation of complete up-to-date municipal electric light and power plant, and any information on the subject will be gladly received by Alderman Jesse Morgan. Population of city is about 3,000.

Portland, Ind.—Sum of \$400 has been appropriated for purchase of cluster light posts for lighting courthouse grounds.

Portland, Ind.—New cluster lights will be purchased for city. G. H. Smith, G. W. Smith, G. Nicholson, Frank White and Dr. M. T. Jay are members of light committee.

Waucoma, Ia.—Citizens have voted in favor of electric light plant and for issuing bonds in sum of \$12,000 for erection of such a plant.

Lexington, Ky.—Merchants will install ornamental street lighting system in business district. Plans call for erection of 88 standards, carrying high candle power lamps. Cost of installation will be borne by merchants and city will maintain lamps.

Delhi, La.—Franchise has been granted for erection of electric light plant to E. Scott.

Melville, La.—Proposal to bond town of Melville to establish electric light plant has been carried at election by vote of 13 to 6.

Kalamazoo, Mich.—Lighting committee of the City Council may shortly purchase 649 ft. of cable, a 30-kw. transformer and motor generator set for municipal electric lighting plant.

St. Joseph, Mich.—A new lamp of nitrogen type, 400 candle power Mazda, is to be installed on municipal lighting system, doubling its capacity without adding one cent to cost of operation.

North Bend, Neb.—Estimates have been made and plans have been drawn for lighting system to cost \$23,000 and plans for new sewerage system are well under way that will cost in neighborhood of \$16,000.

Bridgeton, N. J.—The City Council is discussing feasibility of providing municipal lighting plant.

Poughkeepsie, N. Y.—Installation of municipal lighting plant is being considered.

Mansfield, O.—Service Director Hursh is advertising for bids for lighting city of Mansfield under plans drawn up by H. W. Jones, consulting engineer.

Sandusky, O.—Installation of ornamental clustering lighting system will be authorized.

Providence, R. I.—Plans for eventual installation of about 7,000 of new type of nitrogen incandescent electric street lights in outlying sections of city, which will increase amount of light 40 per cent, at no increase in cost, are being discussed by City Council committee on lighting.

Wessington, S. D.—Town Council has voted to install municipal street lighting system.

Rutland, Vt.—Installation of ornamental lighting system in business district is being considered. It is proposed to erect ornamental standards carrying five-lamp clusters.

Seattle, Wash.—J. D. Ross, superintendent of lighting, is considering plans for installation of lighting system for alleys in business district, to cost from \$8,000 to \$10,000.

Spokane, Wash.—City is considering construction of municipal electric light plant and telephone system.

Manitowoc, Wis.—It is estimated that improvements and new building for municipal lighting and power plant will cost city \$60,000.

CONTRACTS AWARDED.

Fort Wayne, Ind.—Board of works will award contract for constructing addition to city lighting plant to Max Irmscher on his bid of \$14,400.

Asbury Park, N. J.—By City Council contract for lighting Railroad Square for period of five years to Atlantic Coast El. Lt. Co., under which company will install 12 standards, carrying five-lamp clusters.

Unadilla Forks, N. Y.—Contract for electric lighting has been let to Charles Bachus.

Revelstoke, B. C.—For water turbine for municipal hydroelectric power plant to Esher, Wyss & Co., Vancouver, at \$10,300, and for generator, exciter and switchboard, to Canadian General Electric Co., \$6,993.

FIRE EQUIPMENT

Turlock, Cal.—Election will be held June 9 to vote on bond issue of \$15,000 for purchase of motor combination chemical and hose wagon, new hose and other equipment and for installation of alarm system.

Washington, D. C.—A consular officer has reported that municipality in his district wishes to purchase new equipment shortly. American manufacturers are asked to send catalogues. Name and address may be obtained from Bureau of Foreign and Domestic Commerce, file No. 13,076.

Springfield, Ill.—City Electrician Fred Spears at conference meeting of City Commissioners has proposed installation of direct fire alarm system to supplant present indirect method now in

use. New system would cost city \$30,000.

Waterloo, Ia.—Bids will be received for motor fire truck.

Claysburg, Ky.—Town Board is considering purchase of hand-drawn apparatus.

Gloucester, Mass.—Purchase of tractor is being urged.

Duluth, Minn.—Purchase of motor aerial truck is being discussed. Safety Director Hicken.

Plainfield, N. J.—Purchase of automobile combination hose wagon and pumping engine is being discussed.

South Orange, N. J.—Ordinance has been adopted providing for purchase of fire apparatus and equipment. Francis Speir is Village President.

Verona, N. J.—County Commissioners of Overbrook have authorized \$5,000 appropriation for purchase of motor combination chemical and hose wagon for this place.

Binghamton, N. Y.—Election will be held for voting on \$60,000 worth of bonds for improvement of fire department. According to statement issued by Fire Commissioner Woodruff money will be expended in purchasing site for fire station in First ward at estimated cost of \$1,400, and erecting building thereon to cost \$10,000; erecting tower for training apparatus, \$1,000; heating, plumbing and furnishing of buildings, \$1,496; purchasing combination chemical wagon for First ward station, \$5,500; buying truck from Lestershire department, \$500; motorizing Central station truck, \$4,800; purchasing 5,000 ft. of hose, \$5,500; hose and chemical apparatus for the Central Station, \$5,500; new fire alarm system, including a fire telephone branch, cables etc., \$14,000, leaving \$9,600 for expenditures not specified.

Cohoes, N. Y.—Finance Committee has reported favorably to Fire Board on appropriation of \$20,000 for purchase of motor combination chemical and hose wagon, two tractors, and chassis for chemical wagon. T. C. Collin is Chief.

Fredonia, N. Y.—One piece of motor apparatus may be purchased shortly. J. M. Zahm is Chief.

Perry, N. Y.—The Citizens Chemical Co. has started campaign to raise funds to buy motor truck large enough to answer needs in protecting village and Silver Lake property from fires.

Schenectady, N. Y.—Communication has been sent in by Department of Public Safety, asking for \$26,000 bond issue for reconstruction of No. 3 hose house, purchase of new motor-drawn combination wagon for No. 7, and building of conduit for fire and police telephone and alarm service. Ordinance was adopted authorizing bond issue.

Northampton, Pa.—Council has decided to purchase modern \$2,000 motor fire engine.

Williamsport, Pa.—Supt. of Public Safety Perry Harman will advertise for bids for motor triple combination wagon, to cost about \$9,000.

Williamsport, Pa.—Funds are being raised for purchase of motor-driven fire apparatus.

Martinsville, Va.—Purchase of one piece of motor apparatus is being discussed. Mayor C. M. Hart.

Superior, Wis.—Motorization of Superior fire department equipment will be completed with exception of two pieces with arrival of triple combination hose cart, chemical and pumping engine, purchase of which city commission has authorized. New apparatus will cost \$10,000.

Chilliwaik, B. C.—Purchase of 1,000 ft. of hose is recommended by Fire Chief.

CONTRACTS AWARDED.

Ansonia, Conn.—To Allen-Totman Co., of Boston, selling agents of Maxim Motor Co., of Middleboro, Mass., for a 90-h. p. motor combination chemical and hose wagon.

Ottumwa, Ia.—To Seagrave Co., for 6-cyl. 80-h.p. motor aerial truck, with 65-ft. ladders, at \$9,500, and one to the White Co. for a 6-cyl. motor combination chemical and hose wagon, at \$5,395.

Newark, N. J.—By Fire Board for auto engine to American La France Fire Engine Co., Elmira, N. Y., at \$8,000.

Pineville, N. Y.—To O. J. Childs Co., of Utica, N. Y., for three chemical engines.

Scotia, N. Y.—By Scotia fire department contract for new truck to Brockway Auto Truck Co. of Cortland. Other bids received were from Mack Co., \$3,000; the Willys Utility Co., \$2,995, and the Federal Truck, represented by Close Brothers, \$2,875. The Brockway Company's bid was \$2,750.

Gastonia, N. C.—To American-La France Fire Engine Co., Elmira, N. Y., contract for a motor triple combination wagon, at \$8,000.

BRIDGES

Dixon, Cal.—County Comrs. have voted to construct bridge over Putah Creek to cost \$50,000.

Denver, Colo.—Causey, Foster & Co., of Denver, have bought \$50,000 bond issue in Madison County, Idaho, which was authorized at recent election for building of bridges and roads in that district.

Bridgeport, Conn.—Stratford Ave. bridge bonds in sum of \$400,000 and East Washington Ave. bridge bonds in sum of \$130,000 have been voted.

Fort Wayne, Ind.—County Commissioners have let contracts for 24 bridges and culverts, some of them new and some for repairs. Numbers of culverts run from 5 to 29, inclusive, with culvert No. 16 omitted because of a disagreement. The contractors and culverts they will build or repair and their bids are as follows: Henry Penn, No. 5, \$340; No. 11, \$288; No. 18, \$388; No. 19, \$408; No. 20, \$428; F. D. Kuse & Co., No. 6, \$415; Baites & Butler, No. 7, \$288; No. 9, \$273; No. 14, \$324; No. 17, \$349; No. 27, \$223; George Jaap, No. 8, \$333; No. 15, \$395; No. 22, \$354; Gallagher & Ryan, No. 10, \$218; No. 12, \$296; No. 13, \$320; No. 21, \$269; H. Tapp Construction Co., No. 23, \$240; No. 24, \$214; No. 25, \$205; Elkhart Bridge Co., No. 26, \$237; No. 28, \$977; No. 29, \$517.

Richmond, Ind.—City Council has voted appropriation of \$12,000 for erecting steel and concrete bridge to replace McGrew bridge.

Lonaconing, Md.—Citizens have voted \$8,000 in bonds for constructing bridge over George's Creek at Union St.

Red Lodge, Mont.—Plans have been completed by C. A. Gibson, County Surveyor, for constructing steel and concrete bridge over Clark Fork River. Estimated cost, \$12,000.

Lawrence, Mass.—For construction of Central bridge, to Ryan & Dean, of Boston, at \$322,186.

Almonessen, N. J.—By Gloucester County Board of Freeholders, contract for new bridge at Almonessen, to E. P. Henry, of Woodbury, at \$2,100. Board decided to spend \$3,000 oiling the roads.

Atlantic City, N. J.—Plans and specifications of six new bridges which are to be built on Mays Landing-Somers Point Rd. have been approved by Board and they will advertise contract for work soon.

Elizabeth, N. J.—Board Chosen Freeholders have voted to construct bridge over Rahway River at St. George Ave., to cost about \$22,000.

New York City, N. Y.—Construction of bridge on series of tunnels from Manhattan to Jersey is being discussed.

Dayton, O.—Contractor Al S. Fox, of this city, has been awarded contract for superstructure of Landman & Buckneck bridges, located just short distance north of Piqua, O., in Miami County, his bids on structures being \$7,228 and \$1,223, respectively. Contracts for substructures were awarded to Geo. K. Moses at his bids of \$1,979 and \$557, respectively.

Miamisburg, O.—County Comrs. have adopted plans for constructing bridge over Miami River at cost of about \$240,000.

Piqua, O.—Lowest bid received for construction of new concrete bridge crossing Miami River was that of Hackedorn Cont. Co., of Indianapolis, at \$94,704.

Doylestown, Pa.—At meeting of County Commissioners contract for construction of new concrete bridge in Quakertown was awarded to Riegelsville Construction Co., at their bid of \$2,040.

Belton, Tex.—City Council has accepted plans and specifications for two new concrete bridges to span Nolan in this city. Contracts for same will be let shortly.

Cotulla, Tex.—Petition has been presented to Commissioners' Court in session asking for election for purpose of voting on \$45,000 bond issue of road and bridge bonds in LaSalle County. Election was ordered.

Ritzville, Wash.—County Comrs. will shortly let contracts for constructing 4 concrete bridges, spans to be about 20 and 45 ft. long.

Washburn, Wis.—Plans for expenditure of about \$30,000 in permanent improvements on bridges and roads of Bayfield county have been prepared by county officials.

Arkansas City, Kan.—To Topeka Bridge & Iron Co., of Topeka, contract for building concrete bridge across Arkansas River, at \$24,565.

CONTRACTS AWARDED.

Minneapolis, Kan.—By Co. Comrs. for constructing Pipe Creek reinforced concrete bridge to J. W. Weaver Constr. Co., Kansas City, Mo., at \$5,298.

Sanford, Kan.—By County Comrs. at Larned for 100-ft. double arch reinforced concrete bridge at Sanford to Topeka Bridge & Iron Co., Topeka, at \$5,635.

Lawrence, Mass.—Ryan & Keon, of Boston, were lowest of five bidders on construction of proposed central bridge when sealed proposals were opened by Central Bridge Commission. Concern's bid was \$322,186. Bidders, their figures and time in which each concern guarantees to complete work follows: Ryan & Keon, Boston, \$322,186, 225 calendar days; T. Stuart & Son Co., Newton, \$423,078, 500 calendar days; Merrill-Ruckgayer Co., New York, \$449,130, 460 calendar days; H. P. Converse & Co., Boston, \$464,652, 548 calendar days; Winston & Co., New York and Richmond, \$696,969, 560 calendar days.

Fredonia, N. Y.—For concrete steel bridge over Canadaway Creek to Corry Bridge & Supply Co., Corry, Pa., for \$3,839.

Collinsville, O.—For constructing 200 ft. concrete bridge by Emergency Comm. to Pan-American Bridge Co., New Castle, Ind., at \$14,000.

Roseburg, Ore.—The Douglas County Court has given contract for building new bridge at Kellogg, across the Umpqua River, to Portland Bridge Co. Price is \$24,389. Bridge is to be of steel construction.

MISCELLANEOUS

Orland, Cal.—The United States Reclamation Office of this city has opened bids for construction of thirty miles of laterals to be constructed in territory embraced in Orland Project. W. H. Mason of Klamath Falls was lowest bidder, while A. Hawkins of Orland was second. All bids were forwarded to Washington, D. C., where contract will be let.

Wilmington, Del.—Building Commission Bonds in sum of \$200,000 will be sold at noon, June 15.

Jacksonville, Fla.—At premium of 103.097, the \$1,500,000 bond issue for municipal docks for this city was purchased by syndicate composed of Atlantic National Bank of this city, the Mercantile Trust & Deposit Co., of Baltimore, and Kountz Bros., bankers, of New York City.

Chicago, Ill.—Supt. J. Foster has been authorized by board of South park commissioners to begin at once beautification of first unit of Grant park in accordance with great general plan which will provide Chicago with most magnificent water front in world. Plans provide for stone balustrades, gravel walks, pergolas and flower gardens and for scheme of landscape gardening as formal approach to Great Lakes fountain on south side of Art institute. Board also ordered advertisements for bids for \$45,000 improvement at south end of Jackson park.

Chicago, Ill.—An offer to collect and dispose of all city's waste for period of twenty years at saving to municipality of \$16,629,000 has been forwarded to Henry A. Allen, assistant city engineer in charge of garbage disposal, by finance committee. Offer is made by Wright Incinerator Company. It proposes to incinerate garbage and rubbish and to manufacture cheap quality of brick from clinker.

Indianapolis, Ind.—Board of Park Commissioners has authorized Harry D. Tutewiler, City Playground Commissioner, to establish playgrounds in Riverside, Brookside and Garfield Parks and Spades place, beginning May 30.

Indianapolis, Ind.—Board has decided to experiment with sanitary drinking fountains on line running from spring in Riverside Park.

New Bedford, Mass.—Sum of \$2,500 is recommended for repairs to police signal system.

Lansing, Mich.—Establishment of municipal garbage crematory is being discussed.

Jackson, Miss.—During past ten days county and municipal bond issues aggregating more than half million dollars have been authorized or sold in Mississippi for public improvement purposes.

Elizabeth, N. J.—An appropriation of \$25,000 with which to convert city's South

Seventh street property into modern recreation field is being considered by Finance Committee of City Council and Playground Commission.

Niagara Falls, N. Y.—Board has adopted resolution recommending that Common Council call special tax election to vote upon construction of proposed new City Hall.

Huron, S. D.—Mayor E. M. Hall recommends a municipal garbage removal system.

Beaumont, Tex.—Election here on issuance of \$175,000 bonds for wharf and dock purposes has been carried.

San Antonio, Tex.—Question of disposal of garbage by contract or erection of municipal garbage incinerator are said to be considered.

Berkley, Va.—Board of Control is preparing to build in Berkley an incinerator to destroy garbage and other refuse matter.

CONTRACTS AWARDED.

San Francisco, Cal.—Contract for construction of Pier 15 at foot of Green St. has been awarded to San Francisco Bridge Co. by Harbor Board. Bid was \$73,000.

San Francisco, Cal.—By Board of State Harbor Commissioners contract for reconstructing pier 19 at foot of Filbert St., to George W. Newsom at \$18,994, lowest of five bids received, varying from that figure to \$23,933.50.

Fort Wayne, Ind.—The Herman Tapp Construction Co. will be awarded contract for construction of concrete retaining wall along west bank of the St. Joe River, above State Street bridge, on its bid of \$15,300, which is nearly \$3,000 lower than proposal submitted by J. H. Collier Co. The Raymond Concrete Pile Co., of Chicago, bid \$29,700 and the Indiana Engineering Co. bid \$12,812 on plans of its own.

Indianapolis, Ind.—Board of Public Works has let contract to Cole Motor Car Co. for Cole automobile to be used by City Engineering Department. Contract price is \$1,665, but allowance on two old cars taken in trade by company reduced net price to \$1,294.

Vincennes, Ind.—Contract for rebuilding and repairing of Russell-Allison levee, which reaches across east part of Lawrence County, Illinois, along west bank of Wabash River, has been let to Fred B. Crain Co., of Omaha, Neb. Cost of construction of levee will be approximately \$90,000.

Flint, Mich.—Contract for concrete mixing machine has been awarded to Milwaukee Concrete Mixer Co. at \$1,360.

Brooklyn, N. Y.—Contract for installation of tracks in Fourth Ave. Subway in Brooklyn will probably be awarded by Public Service Commission to Thomas Crimmins Contracting Co., of New York, at \$210,880. The Degnon Contracting Co. asked \$220,051, M. J. Drummond & Co. and William F. Jordan \$287,000, and Eastern Contracting Co. \$367,435.

Niagara Falls, N. Y.—Contract for improvements to public market has been let to McKinney & McGuire, low bidders, at their figure of \$9,671.30.

New York City, N. Y.—Booth & Flinn of Philadelphia submitted lowest bids for construction of both of East River tunnels in dual subway system. Bid was \$12,461,000. The Holbrook, Cabot & Rollins' bid was \$12,677,000.

New York City, N. Y.—By Public Service Commission contract for construction of Section 6A of new Interborough 7th Ave. subway to lowest bidder, the Holbrook, Cabot & Rollins Corporation of Boston, Mass. This section begins behind Times Bldg., little to north of 42d St. and goes up 7th Ave. to make junction with present subway, to north of 43d St.

Schenectady, N. Y.—By Board of Supervisors contract for laundry machinery and cooking apparatus for new county jail to Carl Frank Co., lowest bidder. Bids received were: John R. Sheehan Co., \$3,043; J. V. Vrooman's Sons' Co., \$3,117.24; Carl Frank Co., \$2,986.78.

Philadelphia, Pa.—For development of League Island Park, contract has been awarded to Edwin H. Van, of Philadelphia, at \$523,565.75. J. J. Hart, of New York, bid \$547,365.

Pittsburgh, Pa.—The Borough of Edgeworth, Pa., has awarded to George H. Guenther the contract to build the new town hall at a cost of \$15,000.

Madison, Wis.—For erection of main hall and dormitory at State Tuberculosis Camp, at Tomahawk Lake, to F. E. Perinier, at \$4,998 and \$2,290 respectively.